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Geology of

Carbonatite – Alkalic Rock Complexes in Ontario:

Poohbah Lake Alkalic Rock Complex

District of Rainy River

**Ontario Geological Survey
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by R. P. Sage

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Foreword

The Poohbah Lake Alkalic Rock Complex was examined as part of a project to study alkalic rock – carbonatite complexes in Ontario. The study describes the rock types and mineralogy of the complex and outlines the history of the mineral exploration efforts within the complex.

V.G. Milne

Director

Ontario Geological Survey



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CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	Multiplied by	Gives	Imperial Unit	Multiplied by	Gives
LENGTH					
1 mm	0.039 37	inches	1 inch	25.4	mm
1 cm	0.393 70	inches	1 inch	2.54	cm
1 m	3.280 84	feet	1 foot	0.304 8	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	1.609 344	km
AREA					
1 cm ²	0.155 0	square inches	1 square inch	6.451 6	cm ²
1 m ²	10.763 9	square feet	1 square foot	0.092 903 04	m ²
1 km ²	0.386 10	square miles	1 square mile	2.589 988	km ²
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
VOLUME					
1 cm ³	0.061 02	cubic inches	1 cubic inch	16.387 064	cm ³
1 m ³	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m ³
1 m ³	1.308 0	cubic yards	1 cubic yard	0.764 555	m ³
CAPACITY					
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	4.546 090	L
MASS					
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	31.103 476 8	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	0.453 592 37	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	907.184 74	kg
1 t	1.102 311	tons (short)	1 ton (short)	0.907 184 74	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	1016.045 908 8	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	1.016 046 908 8	t
CONCENTRATION					
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in cooperation with the Coal Association of Canada.

**Geology of
Carbonatite – Alkalic Rock Complexes in Ontario:
Poohbah Lake Alkalic Rock Complex
District of Rainy River**

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Abstract

The Poohbah Lake Alkalic Rock Complex lies within the Quetico Subprovince of the Superior Province of the Canadian Shield and is the type locality for the rock type known as malignite (nepheline + pyroxene + potassium feldspar). The complex is oval in plan view with a northeast-striking long axis and consists predominantly of three rock types: coarse-grained leucocratic pyroxene syenite, coarse-grained melanocratic pyroxene syenite, and nepheline-bearing mafic syenite (malignite). The complex has been dated by K-Ar isotopic techniques at 2706 ± 23 Ma and is cut by granitic pegmatites dated at 2550–2630 Ma. A Pb-Pb isochron suggests an age of 2667 ± 5 Ma for the complex. The complex, which lies within the boundaries of Quetico Provincial Park, is not known to contain mineralization of economic interest.

Résumé

Le complexe rocheux alcalin du lac Poohbah est situé dans la sous-province Quetico, dans la province Supérieure du bouclier canadien. Cette région est généralement formée de malignite (néphéline + pyroxène + feldspath de potassium). Vu en plan, le complexe est de forme ovale et son axe est orienté vers le nord-est. Le complexe est formé de trois types de roche: de la syénite pyroxène leucocrate à gros grain, de la syénite pyroxène mélanocrate à gros grain et de la syénite mafique contenant de la néphéline (malignite). D'après les techniques isotopiques de datation au K-Ar, l'âge du complexe est de 2706 ± 23 Ma. Il est divisé par des pegmatites granitiques dont l'âge est de 2550–2630 Ma. Selon une isochrone Pb-Pb, l'âge du complexe serait de 2667 ± 5 Ma. La minéralisation du complexe, qui est situé dans les limites du parc provincial Quetico, ne représenterait pas de valeur commerciale.

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Introduction

The Poohbah Lake Alkalic Rock Complex is the type locality for the rock type malignite. This rock was first described by Lawson (1896) and consequently, reference to Poohbah Lake appears in most textbooks dealing with petrology and in particular the petrology of alkalic rocks. Sorenson (1974, p.569, p.27) defined malignite as a melanocratic nepheline syenite containing more than 50% mafic minerals. Since the complex is a type location for one type of alkalic rock it was selected as one of several Early Precambrian alkalic rock complexes to study in order to provide data for comparison with younger alkalic complexes. In addition to malignite, the complex contains a number of phases of syenitic rocks which are gradational into each other. The syenitic rocks can be subdivided on the basis of the relative percentage of the various mineral phases rather than on the basis of contrasting texture and mineralogy.

Since the Early Precambrian alkalic rocks in Ontario appear to have limited economic value, little mineral exploration has taken place on complexes of this age group.

The complex was emplaced into Early Precambrian biotite-quartz-plagioclase schists and has in turn been cut by younger, coarse-grained quartz monzonite pegmatite.

Acknowledgments

Mr. William Wright served as senior geological assistant during the mapping program at Poohbah Lake. Mr. Wright mapped the northeast corner of the complex, the islands in the northeast corner of Poohbah Lake, the north shore of Poohbah Lake, Wink Lake, and portions of the large lake immediately northwest of Poohbah Lake. Mr. Paul Chamois and Mr. Carl Higgins assisted the author and Mr. Wright in the mapping process. Logistical support was supplied to the party by Ministry of Natural Resources aircraft based at Nym Lake. The efforts of Mr. D.A. Fawcett, Mr. P.H. Hambly, Mr. J.W. Keenan, Mr. R.A. Baxter, Regional Director, North Central Region, and Mr. M.P. Parker, District Manager, Atikokan District, facilitated the mapping program. In 1988, the tables in Appendix A were revised and the statistical data for the lithologic units were recalculated by Mr. A. Lisowyk.

Location and Access

The Poohbah Lake Alkalic Rock Complex (Figure 1) lies within Quetico Provincial Park approximately 19 km north of the United States-Canada border. The center of the complex lies at approximately 48°22'30"N Latitude and 91°42'W Longitude. Poohbah Lake can be reached by portaging up Poohbah Creek from the Maligne River or by fixed-wing aircraft from Nym Lake located approximately 5 km southeast of Atikokan. The complex covers an area of approximately 49.8 km² centred on Poohbah Lake. Outcrop is not abundant, and is concentrated in the northern half of the complex, principally along the shoreline of Poohbah Lake. Scattered outcrops are also present away from the shore of the lake.

Field Methods

Mapping was plotted on acetate overlays to airphotos at a scale of 1:15 840, supplied by the Airphoto Library of the Ministry of Natural Resources. The data

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAB LAKE

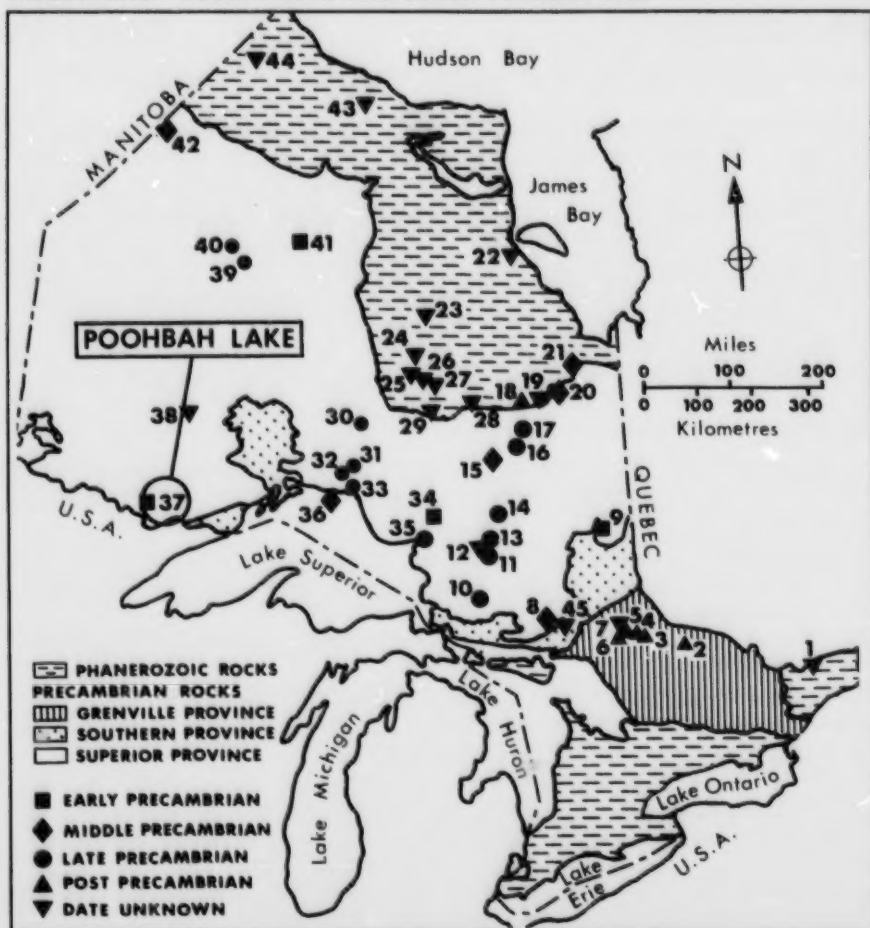


Figure 1. Key map showing location of carbonatite - alkalic rock complexes in Ontario.

- | | | |
|--------------------|------------------------|---------------------------------|
| 1. Eastview | 17. Clay-Howells | 32. Prairie L. |
| 2. Brent | 18. Hecla-Kilmer | 33. Port Coldwell |
| 3. Callander B. | 19. Valentine Tp. | 34. Herman L. |
| 4. Manitou Is. | 20. Goldray | 35. Firesand R. |
| 5. Burritt Is. | 21. Argor | 36. Slate Is. |
| 6. Iron Is. | 22. Lawashi R. | 37. Poohbah L. |
| 7. Lavergne | 23. Poplar R. | 38. Sturgeon Narrows & Squaw L. |
| 8. Spanish R. | 24. Albany Forks | 39. Schryburt L. |
| 9. Otto Stock | 25. L. Drowning R. | 40. Big Beaver House |
| 10. Seabrook L. | 26. Kingfisher R. West | 41. Wapikopa L. |
| 11. Lackner L. | 27. Kingfisher R. East | 42. "Carb" L. |
| 12. Borden Tp. | 28. Martison L. | 43. Gooseberry Br. |
| 13. Nemegosenda L. | 29. Nagagami R. | 44. Niskibi L. |
| 14. Shenango Tp. | 30. Chipman L. (dikes) | 45. Nemaq L. & Lusk L. |
| 15. Cargill Tp. | 31. Killala L. | |
| 16. Teetzel Tp. | | |

were transferred from the acetate overlays to a cronaflex base map, at the same scale.

The complex was mapped using canoe and paddle. Nearby lakes north, south and east of the complex were reached by portaging. The lack of motorized transport to the work sites and between observation points prevented the completion of traverses southeast and southwest of the complex within the allowable time.

Previous Geological Work

The Poohbah Lake Alkalic Rock Complex became prominent in geological literature from the work of Lawson (1896) who on the basis of samples collected at Poohbah Lake described and defined a rock composed principally of nepheline, pyroxene, and potassium feldspar as malignite. The Poohbah Lake Alkalic Rock Complex is thus the type locality for this rock.

Allen (1942) completed additional work on the malignites, defined the associated rock types, and prepared a map outlining the intrusive complex. Tanton (1940) prepared a reconnaissance map of the area enclosing the Poohbah Lake Alkalic Rock Complex that indicated the general regional setting of the intrusion.

Mitchell (1976) determined K-Ar isotopic ages for the Poohbah Lake complex and granitic intrusive rocks that cut the complex. Mitchell and Platt (1978) published chemical and mineral data on the complex and redefined the term malignite. More recently, aspects of the complex have been studied by Bell *et al.* (1982), Dunlop (1985) and Kwon (1986).

Physiography

In general the complex itself is of low relief, rarely exceeding 22 m above the level of Poohbah Lake. Southeast of the complex, a ridge over 30 m high is present. The surface of the complex is generally low and rolling, with areas of outcrop and rounded hills of glacial till separated by low swampy ground. The area is not difficult to traverse and relatively good portages connect Poohbah Lake and the larger nearby lakes.

Laboratory Techniques

Representative samples of the various lithologies were selected for thin sectioning. Those samples selected for complete rock analysis were stained for potassium to aid in the identification of potassium feldspar in thin section.

In the field, weathered rims were removed as completely as possible from all samples worthy of analysis and subsequently all samples were trimmed by diamond saw. The final trim with diamond saw removed any remaining weathered surface and visual evidence of alteration.

The thin sections were examined very briefly and a brief description of the thin sections for the analyzed samples appears in Table A-1 (Appendix A).

Nomenclature

Nomenclature used in mapping the alkalic rock - carbonatites of Ontario was modified after that of Parsons (1961). The author has used a somewhat different nomenclature in the present report, in conformity with the nomenclature used in describing other alkalic rock - carbonatite complexes in northern Ontario. For the alkalic rocks, the author prefers to use mineralogic, colour, or textural modifiers, which are familiar to all readers, rather than unfamiliar rock names. Alkalic

rock nomenclature is cumbersome, due in large part to the profusion of unfamiliar rock names. Consequently, as an aid to the reader, the use of less familiar rock names will be limited. The rock terms retained by the author and the way they are used are given below.

Ijolite. A nepheline-pyroxene rock with a nepheline content between 30 and 70%. Rocks containing more than 70% nepheline are classified as urtite and those with less than 30% as melteigite. Some specimens may contain significant amounts of biotite in place of pyroxene. Potassium feldspar content is 10% or less and those rocks with 10% or less nepheline are classified as pyroxenite.

Malignite. A melanocratic nepheline syenite. In general, nepheline, pyroxene and potassium feldspar occur in roughly equal proportions. The potassium feldspar content must exceed 10% or the rock is classified as belonging to the ijolite suite. Both the nepheline and pyroxene content must exceed 10% or the rock would be classified with the syenites. This rock group is transitional between the ijolites and overlaps the syenitic rock groups.

Syenite. This term is restricted to a quartz-free rock consisting primarily of alkali feldspars. Various mafic minerals and nepheline may be present and form a significant component of the rock. The syenites are named on the basis of their mineralogy, i.e., pyroxene nepheline syenite, biotite amphibole syenite, etc. The syenites are gradational into malignites.

There is no standard subdivision of the ijolite suite into ijolite, urtite, and melteigite. Bailey (1974) classified urtites as having more than 70% nepheline, however he used the term ijolite to apply only to those rocks containing between 50 and 70% nepheline. The author finds this range to be too restricted for field use and prefers the 30 to 70% range given by Williams *et al.* (1954, p.70).

Malignite from the Poohbah Lake Complex in northwestern Ontario was originally defined by Lawson (1896) as an alkali-rich rock containing pyroxene, and potassium feldspar, with or without nepheline, garnet and amphibole. The author has examined the malignite of this complex in the field and in a large number of thin sections. The malignites are melanocratic and contain pyroxene, nepheline, orthoclase, garnet, and amphibole. The nepheline content of the type location is relatively low compared with the definition given above. For field work and to better emphasize the gradational nature of malignite into ijolites and syenites without the use of cumbersome terminology, a broader usage of the term has been applied by the author. Williams *et al.* (1954, p.65-66) described a number of malignites of varying mineralogy.

The Poohbah Lake type location for malignite was re-investigated by Mitchell and Platt (1978) and malignite was redefined by them as a nepheline syenite containing oikocrystic potassium feldspar. The author considers the definition of Mitchell and Platt too restrictive. The term malignite is used by the author for a melanocratic nepheline syenite as defined by Sorensen (1974, p.27).

General Geology

The Poohbah Lake Alkalic Rock Complex (Table 1, Figure 2 and Figure 3, Chart A) consists predominantly of three rock types: malignite, and leucocratic and melanocratic pyroxene syenite, which have been emplaced into metasedimentary biotite-quartz-plagioclase schists of the Quetico Subprovince of the Superior Province. Mitchell (1976) reported a K-Ar isochron age of 2706 ± 23 Ma for the Poohbah Lake complex and apparent K-Ar isotopic ages of 2550-2630 Ma for the granitic rocks that intrude the complex. Recently, Kwon (1986) suggested an age of 2667 ± 5 Ma for the complex on the basis of a Pb-Pb isochron. The general northeast-trending elliptical outline of the body is well illustrated on aeromagnetic map 1131G (see Figure 2).

The malignitic rocks (nepheline + pyroxene + potassium feldspar) occur as roughly arcuate medial units enclosed within an outer unit of coarse- to very coarse-grained syenite. The malignites in turn enclose a core of coarse- to very coarse-grained syenite similar to the syenite of the outer unit. There are no visually identifiable textural, compositional, or age differences between the outer and inner coarse-grained syenites.

The malignites are dark green-black to black, fine grained to medium grained mafic rocks which, on weathered surface, may be slightly pitted due to weathering out of the nepheline. Apatite is a common accessory mineral.

TABLE 1. TABLE OF LITHOLOGIC UNITS FOR THE POOHBAL LAKE ALKALIC ROCK COMPLEX.

CENOZOIC

Recent

Swamp, lake and stream deposits.

Pleistocene

Boulder till, gravel, sand, pebbly sand.

Unconformity

EARLY PRECAMBRIAN (ARCHEAN)

Felsic Intrusive Rocks

Red granite pegmatite dikes; grey microcline pegmatite.

Intrusive Contact

Poohbah Lake Alkalic Rock Complex

Dike rocks

Diatreme breccia with syenite clasts and a few mafic casts.

Syenite

Pyroxene syenite, medium to coarse grained, trachytoid; amphibole syenite, very coarse grained, trachytoid, melanocratic; hornblende-pyroxene syenite, medium to coarse grained; contact zone syenites.

Malignites and Associated Alkalic Mafic Rocks

Malignite, medium grained; mafic syenite, medium grained, porphyritic; pyroxenite and associated coarse-grained syenite.

Intrusive Contact

Metasediments

Biotite-quartz-plagioclase schist; hornblende-biotite-plagioclase schist.

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAB LAKE

The syenites are generally composed of coarse- to very coarse-grained potassium feldspar with an interstitial mafic matrix constituting 10–30% of the rock. The exposures with the higher mafic content contain the larger feldspar crystals and display the best developed trachytoidal textures which are common throughout the syenitic phases of the body. Rarely, mafic segregations impart a weak banding which is oriented conformable to the feldspar orientations.

No evidence of carbonatite intrusions or development of fenite in the enclosing wallrocks was observed. On a lake in the northwest corner of the complex one outcrop of diatreme breccia(?) was found. Along the southeastern and eastern flanks, the complex has been cut extensively by very coarse-grained, pale pink granite pegmatite. The pegmatite intrusions are in sharp contact with the syenite.

Table 1 lists the lithologic units for the Poohbah Lake complex and Figure 3 (Chart A, back pocket) is a geological map of the complex.

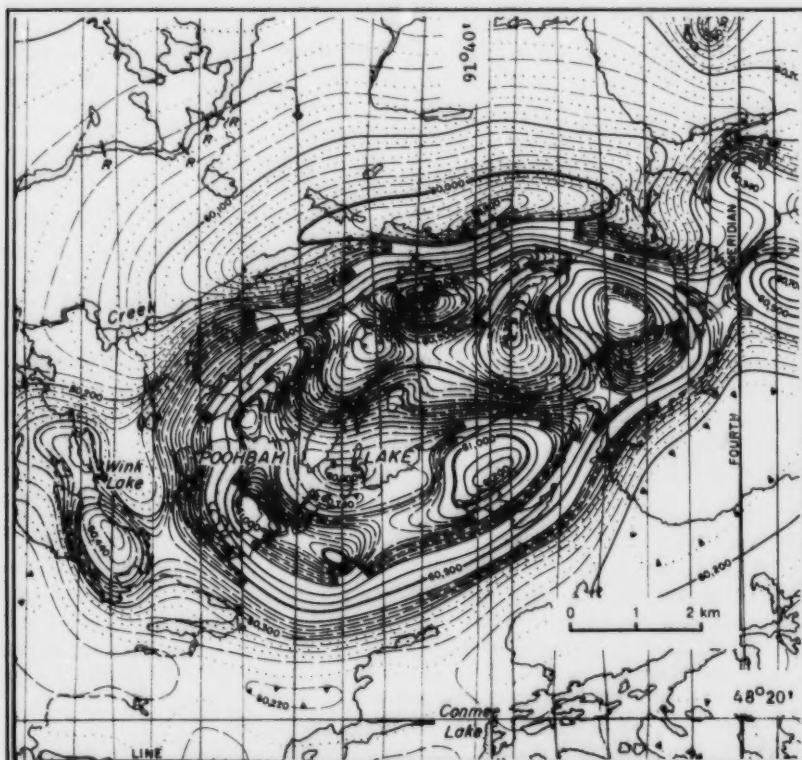


Figure 2. Aeromagnetic map of the Poohbah Lake Alkalic Rock Complex. From aeromagnetic map 1131G (ODM-GSC 1961).

EARLY PRECAMBRIAN (ARCHEAN)

METASEDIMENTS

Schistose rocks (unit 1), classified as part of the Couchiching Schists (Lawson 1896; Allen 1942) envelope the Poohbah Lake Alkalic Rock Complex. The author considers them to be Early Precambrian in age and sedimentary in origin.

The rocks have a generally well developed schistosity which is defined by the preferred orientation of the biotite grains. Primary sedimentary features were not observed in the schists by members of the field party. Some compositional banding (bedding?) and a generally high biotite content is interpreted by the author to imply a sedimentary origin.

One outcrop at the north end of Berniece Lake contains what appears to be clasts up to 10 cm in length. This unit could be either a water-laid tuff or conglomerate. Other exposures in the same area are brecciated, highly contorted, and have a mixed appearance that makes any interpretation as to primary origin difficult if not impossible (Photo 1). The mixed appearance of the breccia is similar to the rheomorphic breccias found along the gabbro-wallrock contact of the Port Coldwell Alkalic Rock Complex.

Some tiny quartz stringers cut the schists and at the north end of Berniece Lake some outcrops contain local areas rich in garnet. The garnet is up to 3 mm in diameter and stands in relief, 1–2 mm above the weathered rock surfaces.

On the unnamed lake south of Poohbah Lake compositional banding 2–3 cm wide was noted. At these outcrops, linear structures in the plane of schistosity are defined by the elongation of quartz and feldspar clots and streaks of muscovite.

In thin section the schists are fine grained, equigranular, granoblastic, with curved to straight grain boundaries. Actinolite as fine needles is present in two

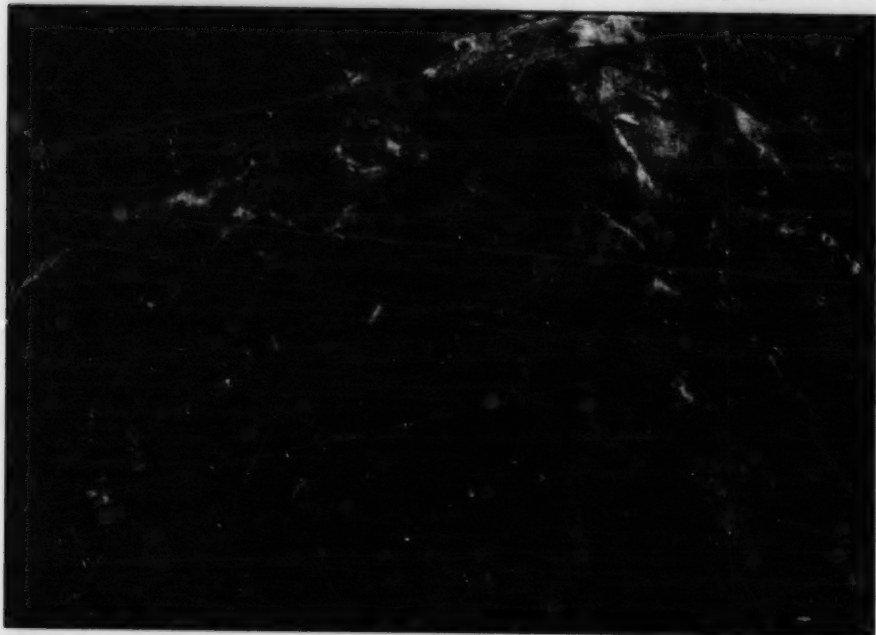


Photo 1. Possible rheomorphic breccia along north contact of Poohbah Lake Alkalic Rock Complex, Berniece Lake. Location P-2 on Figure 3.

thin sections in minor quantities. Biotite defines a schistosity and is present in quantities of 20–45%. Plagioclase and quartz form an interlocking mosaic of grains. Some of the plagioclase is untwinned. A number of clear grains looking a great deal like quartz are optically biaxial indicating that they are feldspar. The ratio of quartz to plagioclase is thus difficult to estimate without staining. The granoblastic quartz and plagioclase comprise an estimated 20–80% of the schists. Minor to trace amounts of epidote, magnetite and garnet are present. Muscovite comprises an estimated 10% of one thin section. Muscovite is generally absent or present only in minor quantities. Hornblende-bearing schists (unit 1b) were not examined in thin section.

Large blocks of hornfelsed wallrock (unit 1c) occur within the eastern portion of the Poohbah Lake Alkalic Rock Complex. In thin section the hornfelsed xenoliths consist dominantly of biotite, sericite, and plagioclase. The biotite contains inclusions of plagioclase and forms 10–40% of the rock. The sericite forms small, radiating, interstitial tufts and comprises an estimated 0–40% of any given thin section. Plagioclase (An20–30) grains form an interlocking mosaic. Minor microcline and magnetite are present and perhaps some of the tufts of sericite may have replaced former nepheline.

The schists along the shoreline at the southeast end of Berniece Lake are somewhat harder to break than normal and may be weakly hornfelsed. Thin sections were not prepared from these rocks.

Allen (1942, p.136) also reported hypersthene, rutile, chlorite and leucoxene in the hornfelsed xenoliths.

POOHBAB LAKE ALKALIC ROCK COMPLEX

Malignite and Associated Alkalic Mafic Rocks

The Poohbah Lake Alkalic Rock Complex is the type location for the rock type malignite (Lawson 1896). Lawson's classic study is too voluminous to reproduce here and the reader should refer to the original document for more detail. Lawson (1896, p.342–353) proposed the rock name "malignite" for a melanocratic syenitic rock consisting of pyroxene and potassium feldspar with or without nepheline, with accessory biotite, sphene, and apatite. Lawson (1896) relied heavily on rock chemistry in defining malignite which was characterized by high alkalis and lime, in contrast to most syenites. While malignite has some characteristics of nepheline syenite, Lawson (1896) considered that its high lime and somewhat lower silica content excluded it from the nepheline syenite classification.

Lawson (1896, p.353–359) also included two other rock types within his definition of malignite: garnet-pyroxene malignite and amphibole malignite. These malignites do not contain nepheline. The garnet-pyroxene malignite contains orthoclase, perthite, clinopyroxene, garnet, biotite, titanite and apatite. The amphibole malignite contains perthite, orthoclase, deep green amphibole, garnet, biotite, apatite, and sphene. In the garnet-pyroxene malignite, the pyroxene is subordinate in quantity relative to the nepheline-pyroxene malignite. In the amphibole malignite the pyroxene is intergrown with amphibole. The feldspars in the nepheline malignite appear to be of the same size and orientation as in the garnet-pyroxene malignite, but in the amphibole malignite the feldspars appear to be somewhat smaller and less parallel in orientation.

The garnet-pyroxene malignite and amphibole malignite are equivalent to the author's map unit 2e. The author restricts the term malignite to the nepheline-

bearing unit (units 2f,c,m). Lawson's garnet-pyroxene malignite and amphibole-malignite were mapped as syenites by the author.

Allen (1942, p.134-151) subdivided the rocks of the complex into 9 lithologic groups: malignite, porphyritic alkalic syenite, nepheline syenite, alkalic syenite, shonkinite, hornblende syenite, melteigite, pyroxenite, granitic pegmatite, and aplite. The malignite, nepheline syenite, and melteigite of Allen (1942) are, in the author's opinion, all part of a distinctive nepheline-pyroxene-potassium feldspar unit which would be broadly classified as malignite and equivalent to the type rock described by Lawson (1896). This unit includes rocks coded as units 2c, 2f and 2m on the accompanying map (Figure 3, Chart A). The granite pegmatite and aplite described by Allen (1942) cut the alkalic rocks and are not likely related to the alkalic rock complex. The contrasting isotopic ages of Mitchell (1976) support this interpretation. The remaining lithologies are considered by the author to be variants of the same general syenite rock type.

Mitchell and Platt (1978) reviewed the use of the term "malignite" and redefined the term "malignite" based on samples collected from the same unit described by Lawson (1896) and Allen (1942). Mitchell and Platt (1978) and the author have restricted the use of the term "malignite" to the nepheline-bearing rocks of the Poohbah Lake Alkalic Rock Complex in contrast to original usage by Lawson (1896).

Mitchell and Platt (1978, p.103) based their definition of "malignite" on feldspar type. For a rock to be a "malignite", the feldspar must be a single non-perthitic potassium feldspar ($>Or_{85}$). Malignite is therefore a variety of nepheline syenite and both leucocratic and melanocratic varieties are possible. This usage is at variance with that of Sorensen (1974, p.27) who restricted the term malignite to a melanocratic nepheline syenite without reference to texture or mineralogy. Mitchell and Platt (1978, p.103) considered malignite not to be typical of carbonatite-ijolite complexes, however malignite rocks that fit their definition are present in the Nemegosenda Lake Alkalic Rock Complex which contains both ijolitic and carbonatitic phases (Sage 1987).

The definition of Mitchell and Platt (1978) greatly restricts the use of the term malignite and on the basis of their definition, malignite would be a relatively rare rock. The author has used the term throughout the alkalic rock-carbonatite complex study as defined by Sorensen (1974, p.27, 569) which equates malignite with a melanocratic nepheline syenite. The author has found the broader usage to be more practical in field-mapping rocks containing nepheline, potassium feldspar and pyroxene in widely varying proportions. However, at the Poohbah Lake Alkalic Rock Complex, the author has restricted the term "malignite" to the same rock unit as Mitchell and Platt (1978).

Malignite

In outcrop malignite (unit 2f) weathers dark green, grey-green, or green-black. On fresh surface the rocks are green to grey-green. The weathered surface may be pitted with small pits of 1 mm diameter or less due to selective weathering of the nepheline. The nepheline is pulverulent and chalky white on the weathered surface.

On freshly broken surfaces, white tabular potassium feldspars poikilitically enclose acicular clinopyroxene, sphene, and apatite. Potassium feldspar forms anhedral oikocrysts up to 2 to 3 cm in diameter. Pyroxene is dark green and forms acicular crystals up to 1 cm in length. Sphene crystals are dark brown,

TABLE 2. MICROPROBE ANALYSES OF MINERALS FROM MALIGNITE AT POOHBAH LAKE. FROM MITCHELL AND PLATT (1978).

	Clinopyroxene Compositions					
	PL91		PL31		PL49	
	C	R	C	R	C	R
SiO ₂	50.94	50.44	49.85	50.02	50.46	50.39
TiO ₂	0.92	1.02	0.98	1.06	1.01	1.09
Al ₂ O ₃	2.46	2.41	3.16	2.66	2.68	2.68
Fe ₂ O ₃	4.15	6.36	4.30	5.95	4.05	6.05
FeO	5.91	6.38	5.52	7.24	5.65	6.46
MnO	0.23	0.27	0.19	0.29	0.23	0.25
MgO	11.91	10.04	11.47	9.69	11.95	9.98
CaO	21.88	20.15	22.14	20.25	22.16	20.45
Na ₂ O	1.61	2.47	1.67	2.31	1.57	2.35
TOTAL	100.01	99.54	99.28	99.47	99.76	99.70

C = Core of Pyroxene Grain

R = Rim of Pyroxene Grain

	Nepheline and Zeolite Compositions					
	1	2	3	4	5	6
SiO ₂	43.06	43.98	42.95	42.02	41.14	42.69
Al ₂ O ₃	33.83	33.48	33.71	33.68	30.77	28.28
Fe ₂ O ₃	0.41	0.28	0.41	0.28	0.02	0.01
CaO	0.13	0.44	0.14	0.51	4.33	4.82
Na ₂ O	16.18	16.07	16.22	16.10	11.11	9.36
K ₂ O	6.90	6.12	6.90	7.44	0.05	0.14
TOTAL	100.47	100.37	100.33	100.03	87.42	85.30

1,2 Polkilitic nephelines, PL31, PL49.

3,4 Intergrowth nephelines, PL31, PL13.

5 Groundmass zeolite, PL31.

6 Intergrowth zeolite, PL91.

Total Fe calculated as Fe₂O₃.

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wedge-shaped and up to 2–3 mm in size. Apatite forms anhedral, green-brown crystals 1 by 3 mm in size.

In thin section the rock is medium grained, equigranular, massive, hypidiomorphic. The mode is estimated to be 20–45% aegirine-augite, 5–15% nepheline, 20–40% orthoclase, 0–15% garnet, 0–20% biotite, 0–1% sphene and 0–2% apatite. One thin section contains microcline.

Pyroxene occurs as euhedral crystals, sometimes with twin planes, and not uncommonly the larger grains are distinctly zoned. The zoned grains have very pale green to colourless cores and gradually become darker green toward the periphery of the grain. Presumably this zoning reflects an increase in aegirine content towards the margins of the grain. Mitchell and Platt (1978, p.95) presented microprobe analyses of the pyroxenes and other minerals in malignite (Table 2). They reported that the pyroxene cores have a composition of $\text{Di}_{71}\text{Hd}_{18}\text{Ac}_{11}$ and the rims have a composition of $\text{Di}_{63}\text{Hd}_{22}\text{Ac}_{15}$. These compositions support the petrographic observations that suggest the rims of the pyroxene grains are more sodic than their cores.

TABLE 2. CONTINUED.

	Feldspar Compositions				
	1	2	3	4	5
SiO ₂	64.41	64.63	64.83	64.74	64.88
Al ₂ O ₃	18.69	18.68	18.52	18.41	18.43
Fe ₂ O ₃	0.07	0.11	0.11	0.09	0.08
CaO	0.03	0.02	0.02	0.00	0.02
Na ₂ O	0.53	0.81	1.31	0.80	0.81
K ₂ O	15.37	15.21	14.62	15.51	15.36
TOTAL	99.10	99.46	99.41	99.54	99.58

1,2 Poikilitic feldspars.

3,4 Core and rim of a poikilitic feldspar.

5 Intergrowth feldspar.

	Garnet and Mica Compositions						
	1	2	3	4	5	6	7
SiO ₂	35.86	35.78	35.22	36.24	38.13	38.32	38.53
TiO ₂	1.02	0.33	3.44	1.89	0.99	0.90	2.47
Al ₂ O ₃	4.52	3.20	3.96	3.88	13.26	13.35	13.10
Fe ₂ O ₃	24.14	25.27	23.48	24.14*	15.99	15.86	12.97
MnO	0.28	0.27	0.24	0.19	0.28	0.27	0.19
MgO	0.14	0.11	0.45	0.35	16.04	16.29	17.48
CaO	33.67	33.51	33.21	33.84	0.03	0.04	0.12
Na ₂ O	0.08	0.06	0.10	0.09	0.10	0.15	0.29
K ₂ O	-	-	-	-	9.90	9.96	9.68
TOTAL	99.71	98.53	100.10	100.62	94.74	95.14	94.83

1,2 Reaction rim garnets about pyroxenes, PL91, PL31.

3 Brown core of a large garnet plate.

4 Paler rim, PL13.

5-7 Mica PL34.

* total Fe as Fe₂O₃

Nepheline is invariably altered, in part, to a highly birefringent mica or zeolite. Lawson (1896, p.347) suggested that kaolinite may be present. The nepheline occurs in several associations: (1) vermicular intergrowths with orthoclase; (2) patchy replacements of the orthoclase; (3) distinct euhedral crystals; (4) possible fillings or replacements along fractures in orthoclase; (5) anhedral interstitial grains between potassium feldspar grains; and (6) rounded blebs with myrmekite-like texture within optically continuous orthoclase. The vermicular nepheline-orthoclase intergrowths may have resulted from the breakdown of pseudoleucite within the crystallizing magma. Watkinson (1973) described such intergrowths and interpreted them to be due to subsolidus breakdown of sodic leucite. Gittins *et al.* (1980) interpreted similar nepheline-potassium feldspar intergrowths within the Batbjerg Alkaline Intrusion, East Greenland, to be due to late-stage magmatic crystallizations. Mitchell and Platt (1978) did not offer an explanation for these nepheline-feldspar intergrowths. The author has also observed rounded blebs consisting of nepheline and potassium feldspar enclosed within optically continuous potassium feldspar. While late-stage magmatic crystallization may account for most of the nepheline-feldspar intergrowths, those intergrowths enclosed within potassium feldspar may have resulted from the breakdown of pseudo-leucite. The euhedral form of some nepheline enclosed in the

feldspar suggests crystallization before the potassium feldspar, and the patchy replacements of nepheline and the presence of interstitial nepheline imply late potassium feldspar crystallization and/or metasomatic replacement. These nepheline-potassium feldspar relations suggest that there were two ages of nepheline crystallization or that nepheline crystallization preceded feldspar crystallization and then continued to crystallize along with potassium feldspar. Mitchell and Platt (1978, p.95) consider nepheline to have crystallized from an intercumulus liquid contemporaneously with potassium feldspar. They reported that the compositions of nepheline forming poikilitic plates in, and intergrowths with, potassium feldspar are the same and imply crystallization temperatures of 500 to 700°C. Mitchell and Platt (1978, p.100) reported that the nepheline is possibly altered to natrolite-thomsonite (*see* Table 2 for nepheline compositions). The above features can all be considered to be magmatic in origin and were described, in part, by Lawson (1896).

Orthoclase is the dominant feldspar. It forms large anhedral grains poikilitically enclosing the pyroxene, apatite, and sphene. Under very high magnification some grains have a faint stringy perthite texture and are perhaps cryptoperthite. In one section the orthoclase crystals display a pronounced tabular form and are oriented subparallel to each other. These crystals display a well developed Carlsbad twinning. The orthoclase displays a mottled or wavy extinction and several grains have a faint to barely discernible quadrille pattern similar to microcline. Mitchell and Platt (1978, p.96) interpreted the patchy extinction of the orthoclase as the incipient development of microcline twinning. They reported that the feldspars have a composition of Or88 to Or95 and a low calcium content (<0.3% An). The feldspars are weakly zoned from sodic cores to more potassic rims (Mitchell and Platt 1978, p.99). Mitchell and Platt (1978, p.99) did not observe perthite and they also considered the orthoclase feldspar to be part of the intercumulus mineralogy (*see* Table 2 for feldspar compositions).

Garnet is yellow-brown in colour and always occurs in anhedral grains. The garnet has a close spatial relationship with biotite and commonly occurs as a series or string of grains along the margins of pyroxene grains. In those samples with a relatively high garnet content, large poikiloblastic garnet grains may enclose pyroxene, feldspar, apatite, biotite, and possibly nepheline to form a sieve-like texture. Some grains lie between grains of pyroxene.

Biotite is dark brown and forms large irregular, roughly tabular, anhedral grains. The biotite occurs between pyroxene grains, partially encloses pyroxene, and forms interlocking masses generally associated with pyroxene. The biotite may, in part, have locally replaced pyroxene. Mitchell and Platt (1978, p.100) interpreted the biotite and garnet to be the result of the breakdown of pyroxene in response to deuteric alteration of the primary pyroxene. The author concurs with this interpretation. Table 2 gives the garnet and mica compositions determined by Mitchell and Platt (1978). The chemistry indicates that andradite is the dominant garnet end-member and that phlogopite is the dominant mica end-member.

Sphene occurs in brown, wedge-shaped, anhedral to predominantly euhedral crystals which are commonly twinned. The sphene is closely associated with the pyroxene.

Apatite occurs as euhedral grains poikilitically enclosed within the pyroxene or as large, anhedral grains marginal to or lying between grains of pyroxene.

Mitchell and Platt (1978, p.100) reported the presence of the accessory minerals apatite, sphene and calcite and minor blue-green amphibole as reaction rims on pyroxene.

Coarse-grained Syenite

At the northwest corner of Poohbah Lake, a distinctive coarse-grained syenite (unit 2m) is closely associated with the more typical malignite rocks (unit 2f).

This syenite is blue-grey in colour on weathered and fresh surfaces. Nepheline, weathering to a chalky white, occupies pits on the weathered outcrop surface. Only one thin section was prepared from this unit. The rock is composed of an estimated 50% string perthite, 20% orthoclase, and 25% pyroxene. The remaining constituents are magnetite, biotite, apatite and altered nepheline. Texturally, the rock is medium to coarse grained, massive, inequigranular-porphyrific-seriate, and hypidiomorphic. The string perthite forms the phenocrysts. This rock is likely equivalent to the nepheline syenite of Allen (1942, p.143) but the author did not observe it to be as widespread as indicated by Allen (1942, p.138).

Mafic Syenite, Pyroxenite

On the south shore of Poohbah Lake, Allen (1942, p.138, p.144) described a rock he called melteigite (>70% pyroxene + nepheline, unit 2g). This unit occurs in the field in close spatial association with biotite pyroxenite. In the field the rock was mapped as a medium grained, dark green to green-black mafic syenite. In thin section the rock is medium grained, equigranular, massive, hypidiomorphic. The mode is estimated to be 20% biotite, 65% clinopyroxene and 11% nepheline. Orthoclase, apatite, and sphene make up the remainder. The author considers the melteigite to be a minor, relatively insignificant, mafic phase of the malignite, perhaps a transitional phase to pyroxenite. The rock can also be described as a nepheline-bearing biotite pyroxenite (unit 2g).

Pyroxenite (unit 2g) was found at two locations within the Poohbah Lake intrusion. One location was on the south shore of Poohbah Lake and the second was on the east shore of Berniece Lake. The pyroxenite on the south shore of Poohbah Lake is associated with a nepheline-bearing biotite pyroxenite previously mapped as melteigite by Allen (1942, p.138, 144).

On the south shore of Poohbah Lake, the weathered surface of the pyroxenite is black to brown-black and here the pyroxenite may be gradational into nepheline-bearing biotite pyroxenite. The rock is medium grained, massive, equigranular, and hypidiomorphic in thin section. The rock contains an estimated 35% brown biotite poikilitically containing inclusions of clinopyroxene. The pyroxene itself forms euhedral to subhedral grains and is augite. The rock may in part be metamorphosed for the biotite has well developed poikiloblastic or sieve-like relationships with the pyroxenes.

The pyroxenite on the east shore of Berniece Lake is black to green-black on weathered and fresh surfaces. The unit is medium grained, equigranular, massive, hypidiomorphic in thin section. The rock contains an estimated 10% sphene, 5% sodic(?) amphibole, 5% plagioclase(?), 5% apatite and 75% clinopyroxene.

The sphene occurs in large, twinned, wedge-shaped crystals. The apatite occurs as anhedral grains poikilitically enclosed in the pyroxene and as anhedral grains marginal or intergranular to the pyroxene. The plagioclase(?) forms irregular, interstitial grains. Green amphibole is present as an alteration of the pyroxene. The pyroxene occurs as interlocking euhedral to subhedral grains.

The pyroxenites may have formed as local cumulate phases of the Poohbah Lake Alkalic Rock Complex.

On a bay on the east side of Poohbah Lake, several outcrops of mafic rock have been included with the melteigite (unit 2c). These exposures contain more feldspar than the melteigite (unit 2g) on the south shore of Poohbah Lake.

In thin section the mafic syenites are fine to medium grained, equigranular to inequigranular-porphyritic-seriate, massive, hypidiomorphic. The mineralogy between thin sections is highly variable. The dominant components are estimated to be 20-30% orthoclase, 0-20% microcline, 15-45% clinopyroxene, 10-20% biotite, 0-10% garnet, and 0-20% plagioclase (albite-oligoclase). Zircon, apatite, and chlorite occur in trace amounts. One thin section contains an estimated 10% carbonate as large interstitial grains which may be primary or late-stage hydrothermal.

Biotite occurs in dark brown grains intergranular to garnet and pyroxene and perhaps as a replacement of pyroxene.

Pyroxene is euhedral to subhedral in outline. It is a pale green clinopyroxene.

Orthoclase and microcline form large, subhedral, optically continuous grains in the porphyritic sample but otherwise they generally form anhedral interstitial grains in the more medium-grained specimens. The phenocrysts tend to be of microcline while the orthoclase locally forms large, optically continuous grains in the more equigranular masses. Both microcline and orthoclase display Carlsbad twinning and margins of the grains are ragged.

Plagioclase (albite to oligoclase) occurs as interlocking aggregates of anhedral grains, which display a weak protoclastic texture. Plagioclase is largely restricted to subsolvus overgrowths on the microcline or as a fine-grained groundmass between the potassium feldspar crystals. One thin section contains a trace of possible altered nepheline. The rock is a melanocratic syenite (unit 2c).

Syenite

The syenitic rocks (units 2a, 2b, 2d, 2e, 2h, 2k) include the garnet-pyroxene malignite and amphibole malignite of Lawson (1896) and the porphyritic alkalic syenite, alkalic syenite, shonkinite, and hornblende syenite of Allen (1942). These rocks are gradational into one another. Both field observations (*see* "Structural Geology") and petrographic observations (weak protoclastic textures) suggest that the complex was emplaced as a crystal mush which underwent some segregation of the intercumulus (mafic) liquid during emplacement. As a consequence of variations in former interstitial liquid content, closely spaced samples can have different compositions and could be classified unnecessarily as different rock types. A sample taken from a mafic band representing the accumulation of interstitial liquid may contain 30% or more former intercumulus liquid while less than a metre away, a feldspar-rich sample may have only 10% former intercumulus liquid. Coding of outcrops on the accompanying map (Figure 3) has been generalized to avoid a cumbersome and unwieldy terminology.

Hornblende-pyroxene Syenite (Wink Lake Syenites)

The syenites of Wink Lake (unit 2a) were distinguished from those within the main part of the complex, since the relationship between the Wink Lake and Poohbah Lake syenites is not certain. They do have, however, approximately the same mineralogy. On weathered surface the syenites of Wink Lake are white, grey, or pink; and on fresh surface they are pink.

In thin section the syenites of Wink Lake are medium to coarse grained, massive, equigranular to inequigranular-porphyritic-seriate, and allotriomorphic to hypidiomorphic. The syenites are visually estimated to consist of 15–20% plagioclase (An5–14), 3–5% sphene, 0–30% sodic amphibole, 0–20% clinopyroxene and 30–65% perthite. Trace to minor amounts of apatite, biotite and magnetite are present.

Stringy to patchy perthite forms anhedral grains. Locally some quadrille twinning of microcline and vestiges of albite twinning are present. The plagioclase forms anhedral crystals in an interlocking mosaic marginal to the perthite and as rims on the perthite.

Clinopyroxene is anhedral to euhedral, pale green to medium green, and likely of the sodic variety as indicated by its pleochroism. The outline of some grains is ragged and the pyroxene is closely associated with, and may locally have altered to, amphibole. The pyroxene occurs in aggregates or clusters of interlocking grains.

Amphibole is deep green, strongly pleochroic, and likely, on the basis of its pleochroism, of the sodic variety. It may be arfvedsonite or barkevikite. It forms ragged, subhedral to anhedral crystals and may, in part, replace pyroxene.

The accessory sphene forms euhedral, twinned, wedge-shaped crystals.

Biotite pyroxenite outcrops at the south end of Wink Lake close to the syenite-schist contact. This outcrop is coded (unit 2g) with the syenites of the Poohbah Lake Alkaline Rock Complex but its relationship to the complex is uncertain. The biotite forms irregular, dark brown grains interlocked with pyroxene. The clinopyroxene is a non-pleochroic augite. Biotite comprises an estimated 60% and clinopyroxene 40% of the rock.

Allen (1942, p.144, p.138) classified the syenitic rocks of Wink Lake as hornblende syenite and shonkinite. The bulk of the samples examined by the author are pyroxene-bearing with amphibole likely being an alteration of the pyroxene.

The paler green pleochroism of the Wink Lake pyroxene implies that the aegirine molecule content of the Wink Lake pyroxenes is lower than that of the pyroxene of the syenites of Poohbah Lake. Allen (1942, p.144) reported the pyroxene to be augite; the author found clearly identifiable augite only in the rather restricted pyroxenite phase.

Pink to Red Pyroxene Syenite

A pink to red phase of syenite (unit 2b) is present at the east end of Poohbah Lake and also occurs as a minor phase of the complex. The grey-pink to pink colour of this lithologic unit on fresh surface distinguishes it from the normally buff to grey-buff syenites that compose the bulk of the complex. The rock is medium to coarse grained, massive, equigranular to inequigranular-porphyritic-seriate, hypidiomorphic. In the porphyritic varieties the rock contains up to 40% phenocrysts of potassium feldspar which rarely are as large as 8 cm. The phenocrysts display a well developed oscillatory zoning on the weathered outcrop surface.

In thin section, the rock is composed dominantly of clinopyroxene and perthite with minor but significant amounts of albite and sodic amphibole. Trace to very small amounts of apatite, sphene, magnetite, pyrite and rutile(?) were noted.

Grey-buff to Buff Pyroxene Syenite

The grey-buff to buff syenites (unit 2d) are coarse grained and weakly to strongly trachytoidal. The outcrops with the best developed trachytoidal texture are highest in mafic mineral content (Photo 2). The rock is grey-buff to very pale pink on weathered and fresh surfaces. The coarser grained, more trachytoidal, and more mafic phases display large 3 to 4 cm long tabular feldspar crystals. The crystals are euhedral in shape, display a well developed concentric zoning, and have slightly ragged edges. The porphyritic phase has a phenocryst content that rarely exceeds 10% in the more mafic-poor phases, and generally is much less. The phenocrysts have a seriate distribution. The greater the mafic mineral content the more apparent the porphyritic texture, since the grey, pink, to bluish-grey feldspars contrast sharply with the black to green-black matrix.

In thin section the rock is fine to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. The rock contains an estimated 0-55% microcline, 0-30% biotite, 5-35% plagioclase, 0-5% sphene, 0-4% apatite, 0-20% garnet, 0-50% clinopyroxene, 0-15% amphibole, and 0-80% perthite. Trace amounts of zircon, magnetite, epidote and sericite are present. In one outcrop near the northeast corner of the unnamed lake south of Poohbah Lake, the primary mafic minerals are altered to chlorite, actinolite, carbonate, and limonite.

Microcline forms subhedral to anhedral grains and generally has a string perthite texture. The crystals may display Carlsbad twinning and invariably have quadrille twinning.

Biotite occurs in dark brown, euhedral to anhedral books and, in part, is an alteration product of pyroxene. It is invariably associated with garnet and in several thin sections from the southeast corner of the complex, biotite and garnet are essentially the only mafic minerals in thin section.

Plagioclase varies from An₂ to An₁₄ (Michel-Levy method) in composition with albite being dominant. The plagioclase rims the perthite and microcline grains and occurs as an interlocking mosaic of grains intergranular to the large microcline and perthite grains. Occasionally, a relatively large perthite grain may enclose apparently fractured and randomly oriented grains of plagioclase which may imply the development of a protoclastic texture during emplacement.

Patch perthite is present and most of it appears to have formed by replacement of larger plagioclase grains by potassium feldspar as indicated by the vestiges of albite twinning within the patch perthites.

The sphene forms euhedral to subhedral crystals, commonly twinned, in association with the other mafic minerals. It rarely occurs poikilitically enclosed in pyroxene and more commonly occurs marginal to the pyroxene grains and partially enclosed by the pyroxene.

Apatite forms small euhedral grains poikilitically enclosed within the pyroxene. Relatively large anhedral grains of apatite are marginal to and intergranular to the other mafic constituents.

Garnet forms anhedral, brown and yellow-brown grains. Garnet is spatially associated with biotite and may in part result from the breakdown of the pyroxene. Several thin sections contain anhedral garnet grains marginal to and clearly outlining the pyroxene grains.

Pyroxene is a clinopyroxene that forms euhedral to subhedral to locally anhedral crystals. The more euhedral grains are present in those rocks of highest

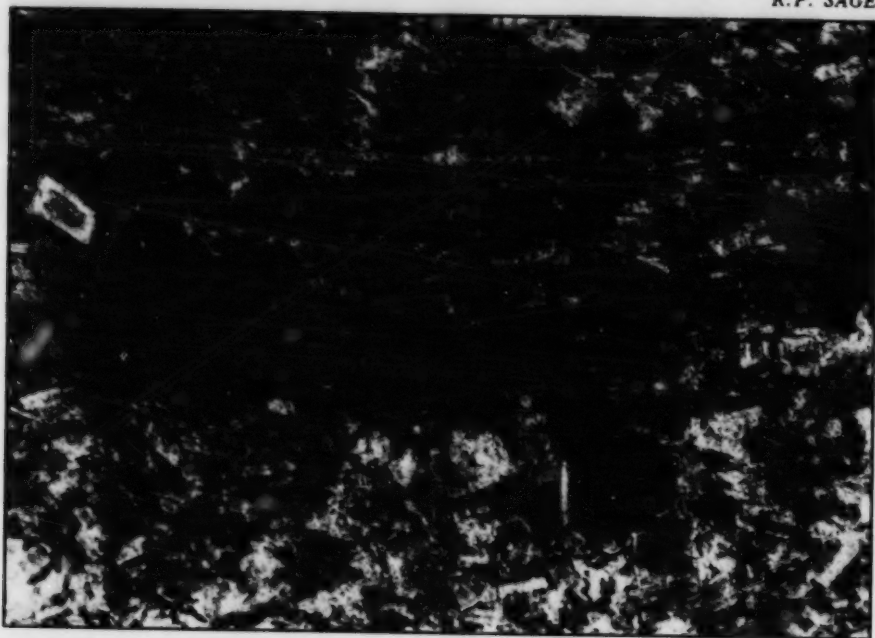


Photo 2. *Grey-buff to buff pyroxene syenite. Trachytoidal texture in more mafic band contrasts with more massive unoriented appearance in leucocratic phase (top). Location P-6 on Figure 3.*



Photo 3. *Melanocratic amphibole syenite, showing zoned phenocrysts of potassium feldspar. Location P-1 on Figure 3.*

mafic content and the more anhedral grains occur in those rocks rich in feldspar or more leucocratic. The rocks with the more anhedral grains generally contain biotite and/or amphibole, commonly with garnet. These minerals may in part result from the breakdown of the pyroxene as implied by the ragged nature of the grains and close association with pyroxene. Larger grains of pyroxene may be zoned from an almost colourless core to a green rim. This zoning likely reflects a greater content of the aegirine molecule towards the periphery of the grain.

Amphibole is dark green and highly pleochroic, possibly a sodic variety. It may be arfvedsonite or barkevikite but its final identification awaits more detailed analytical work. The amphibole is anhedral in outline and appears to largely have formed by the alteration of pyroxene.

Perthite is a string perthite and in some cases a cryptoperthite. It, along with microcline, forms the larger grains of feldspar. Carlsbad twinning is not uncommon in the perthite grains.

On the southern of the two islands in the center of Poohbah Lake and on one outcrop on the northwest shore of the lake, fractures 1 to 2 cm wide are filled with red-brown garnet. These garnet-filled fractures are rare.

Melanocratic Amphibole-Pyroxene Syenite

With increasing mafic content the grey buff to buff syenite is gradational into a black to green-black melanocratic phase (unit 2e) (Photo 3). The best exposures of this rock type occur on the most northern of the two islands in the center of Poohbah Lake. This unit appears to be approximately equivalent to Lawson's garnet-pyroxene malignite (Lawson 1896, plate 18). In the field this unit is characterized by its relatively high mafic content (50-70%) and well developed trachytoidal texture. The tabular blue-grey feldspars approach a maximum of 8 cm in length and display a well developed concentric zoning. On weathered surface the widths of zones within the large zoned feldspar crystals varies from 1 to 4 mm. The feldspars weather in relief above the mafic minerals and may protrude above the outcrop surface by 1 cm. The mafic matrix is fine to medium grained. Textural relations suggest that the mafic component was the liquid phase in which the feldspars were enclosed. On the basis of feldspar-mafic mineral relationships prior to crystallization the mafic components represent intercumulus liquid in a crystal mush of feldspars. On the basis of field observations the melanocratic unit represents a phase of the pluton which at the time of emplacement had a high concentration of the intercumulus liquid. The extremely well developed trachytoidal texture in some exposures attests to the fluidity of the intruding crystal mush. As the proportion of mafic material decreases and the proportion of feldspar crystals increases, the degree of development of the trachytoidal texture decreases.

The mafic minerals within the melanocratic amphibole-pyroxene syenite are identical to those in the more leucocratic syenites (unit 2d).

Contact Zone Syenites

A syenite of highly variable texture and composition (unit 2h) is generally found close to the contact area of the pluton. The rock is commonly xenolithic with wallrock fragments. The xenolithic rock varies from leucocratic to mafic and occurs locally, marginal to included blocks within the various syenitic phases of the complex.

A minor porphyritic phase (unit 2k) of the syenite occurs at the south end of Berniece Lake. The rock is pink to grey-pink on fresh and weathered surfaces. It

is fine to coarse grained, massive, inequigranular–porphyritic–seriate, and hypidiomorphic. The feldspar phenocrysts are up to 8 cm in length in a fine- to medium-grained groundmass. The phenocrysts are hiatal with the groundmass and seriate with each other. This rock type appears to be restricted to the area of the contact of the complex with the enclosing schists. The mineralogy and respective mineral and textural relations are identical to the leucocratic and melanocratic phases of syenite, previously described (i.e. units 2d and 2e). This minor unit of syenite can easily be distinguished from the other syenites on the basis of colour and the hiatal nature of the feldspar phenocrysts.

Dike Rocks

Only one possible dike rock was located within the Poohbah Lake intrusion (unit 3a). This dike was found along the shoreline in the extreme southeast corner of the large unnamed lake located northwest of Poohbah Lake. This dike contains xenolithic clasts of rocks of the complex and was interpreted by the author as a late-stage breccia or diatreme intrusion related to the alkalic events associated with emplacement of the complex. The dike could not be traced beyond this one exposure. The breccia is likely a diatreme formed by the sudden release of entrapped volatiles beneath a cooled rind in an apical region of the pluton, perhaps in the manner postulated by Norton and Cathles (1973).

The dike is black on fresh and weathered surfaces. In addition to the numerous locally derived syenite clasts, at least two other mafic clasts are present.

One thin section was prepared from a mafic xenolith that weathers high and one thin section was prepared from a mafic xenolith that weathers down. The xenolith resistant to weathering consists of clinopyroxene, biotite, perthite and apatite. It is a melanocratic syenite, likely a fine-grained, earlier chilled contact facies of the complex. The xenolith that weathers down consists of 95% augite and the remainder is a mixture of biotite and plagioclase. It is a pyroxenite, most likely of an early formed cumulate phase of the complex.

Xenoliths

Xenolithic inclusions are widespread throughout the complex. They increase in number towards the east, perhaps indicating a higher level of exposure of the complex to the east. The inclusions are of three types: (1) wallrock; (2) early formed syenite; and (3) pyroxenite. The xenoliths are distinct from the large blocks of wallrock which are located principally in the eastern portion of the complex. The large xenolithic blocks located in the eastern portion of the complex have been coded separately (unit 1c) on the accompanying map (Figure 3).

The small wallrock schist inclusions were not examined in thin section. They commonly weather low, have a rusty colour, and rarely contain feldspar phenocrysts oriented tangential to the margins of the clast.

The syenitic inclusions generally weather to the same level as the syenite host rocks. Two of these xenoliths were examined in thin section. The clasts are fine grained, equigranular, massive, allotriomorphic, with curved grain boundaries. The clasts are composed principally of plagioclase (saussuritized), clinopyroxene, perthite, and microcline. Apatite, sodic amphibole, sphene, and biotite are also present. The inclusion is a melanocratic phase of the more typical syenitic rocks. The texture is aplitic and the rock likely represents an earlier chilled phase of the syenitic magma.

Two thin sections were prepared from the mafic inclusions that weathered low. The rocks are fine grained, equigranular, allotriomorphic, with curved to

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straight grain boundaries. The samples are composed of approximately equal amounts of biotite and pyroxene. These biotite pyroxenites are likely early formed cumulate phases of the complex.

FELSIC INTRUSIVE ROCKS

Coarse-grained, red granitic pegmatites (unit 4a) sharply cross-cut and intrude the east and south flanks of the Poohbah Lake Alkalic Rock Complex. The granitic rocks consist of plagioclase (plagioclase albite), microcline, perthite, and quartz. More rarely, amphibole or biotite may be present. Individual cleavage faces on the feldspars may be up to 10 cm on an edge and one pegmatite on the east side of Berniece Lake has amphibole crystals 12 cm long. Graphic textures (quartz-feldspar intergrowth) are present in some pegmatite dikes. Mitchell (1976) quoted an apparent K-Ar isotopic age of 2550–2630 Ma for the granitic dikes.

One exposure at the extreme southeast corner of Poohbah Lake is cut by a coarse-grained, grey microcline pegmatite with little quartz. This dike may be a late stage pegmatitic segregation of the complex itself. On the basis of mineralogy and colour, it appears to be distinctly different from the more typical red granitic dikes.

PETROLOGY

A select group of rocks were chosen for complete rock analysis (Tables A-2, A-3, Appendix A). All specimens were as fresh as possible with all weathered surfaces, altered or xenolithic material being removed before analysis. The author considers the complex to be the product of intrusion of a crystal mush which may have contained at a maximum an estimated 20–30% liquid. Therefore the chemical analyses cannot be used to define liquidus trends but can be used only for comparison with other alkalic rock suites. The norms (Table A-4, Appendix A) were calculated using the procedure of Irving and Barager (1971). This calculation was not designed for alkalic rocks and the data are presented for comparative purposes only.

The chemical compositions are plotted on AFM diagrams (Figure 4). Figure 4b displays the chemical variation within the nepheline-bearing rocks (unit 2f). The nepheline-bearing phases overlap with nepheline-free rocks of map unit 2d and 2e (Figure 4d,e). The overlapping and spread of data may be a function of the generally coarse-grained and cumulate nature of the syenitic rocks. The author has also purposely attempted to avoid a cumbersome nomenclature and has thus not attempted rigorous classification into subtle subunits. This process leads to rock groupings more variable in mode than a more strict subdivision based on relative mineral portions would, and consequently a greater spread in chemical data can be anticipated. A stricter lithologic subdivision would require additional mapping at a more detailed scale.

The moderate splitting of the leucocratic and melanocratic phases (units 2d and 2e) is largely a function of the relative mafic content of the two phases.

Minor element content displays nothing unusual. The high barium and strontium values are typical of rocks of this type.

Mitchell and Platt (1978, p.93) consider the clinopyroxene and apatite of the malignite lithology to be cumulate mineral phases and the orthoclase and nepheline to represent intercumulus mineral phases. On the basis of textural relations, the author would generally concur with this interpretation.

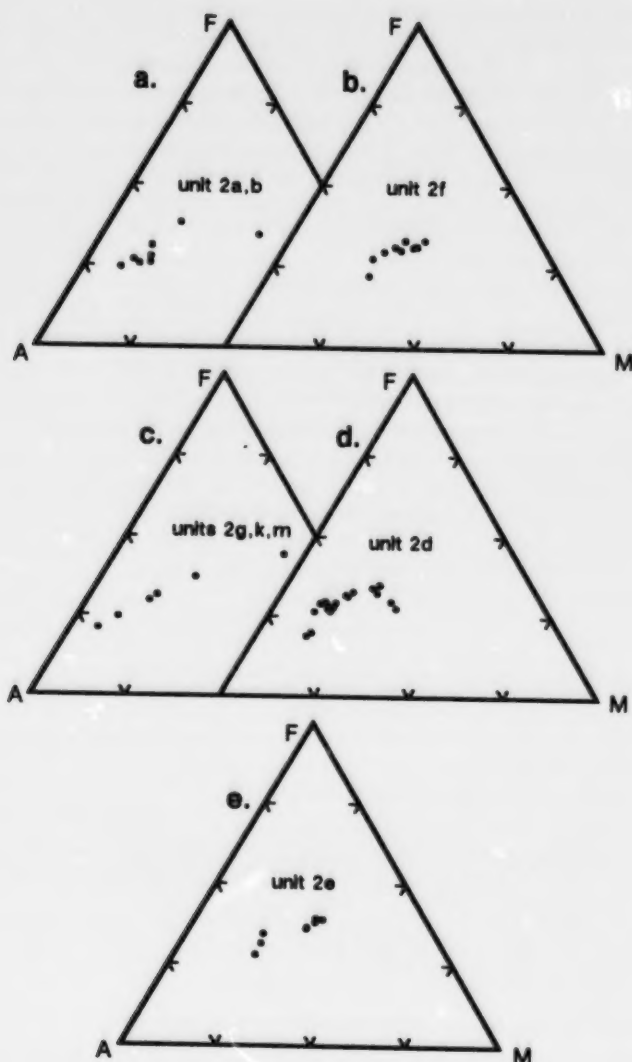


Figure 4. AFM plots of samples from the Poohbah Lake Alkalic Rock Complex. a. Units 2a, b, hornblende-pyroxene syenite and pink to red pyroxene syenite. b. Unit 2f, malignite. c. Units 2g, k, m, pyroxenite and mafic syenite. d. Unit 2d, grey-buff to buff pyroxene syenite. e. Unit 2e, melanocratic amphibole syenite. A = $\text{Na}_2\text{O} + \text{K}_2\text{O}$; F = FeO (total); M = MgO.

METAMORPHISM

In the field the rocks of the complex appear relatively unmetamorphosed and little evidence of metamorphism can be found in thin section. The pyroxene is commonly euhedral in outline and undoubtedly unmetamorphosed. The pyroxene locally has undergone alteration to an amphibole which in some cases has altered to biotite. The garnet is also likely an alteration after pyroxene. While

the development of these alteration minerals can be attributed to a metamorphic event, they are also common in much younger alkalic rock intrusions such as the Killala Lake Alkalic Rock Complex (Sage 1988). Consequently, the alterations are considered by the author to be due to autometamorphic or deuteric phenomena at the time of emplacement. The string perthites are exsolved hypersolvus feldspars and the patch perthites are interpreted by the author to be representative of an autometamorphic or a deuteric event consisting of potassium feldspar replacement of plagioclase. The anhedral mosaic of plagioclase grains enclosing the larger string perthites could possibly be the result of recrystallization of plagioclase exsolved from the perthite grains. The observed textures are likely the result of magmatic processes and thus the intrusion is interpreted to be essentially unmetamorphosed.

The enveloping schists were not examined in detail by thin section. The schists are quartz-plagioclase-biotite rocks rarely containing garnet. Pending more detailed studies the author would classify the enclosing rocks as having been metamorphosed to the quartz-albite-epidote almandine facies rank of regional metamorphism (Turner and Verhoogen 1960, p.536-540). Allen (1942, p.136) reported the presence of sillimanite in the schists between Wink and Poohbah Lake. Sillimanite was not observed by the author. The lack of metamorphic textures within the alkalic rocks indicates that the emplacement of the Poohbah Lake complex post-dated regional metamorphism.

No evidence of contact metamorphism of the schists by the complex was observed except on the east side of Berniece Lake where some outcrops of schists are hard and break into blocks, typical of hornfels. Evidence for a metasomatic or fenite halo is also lacking, though this may in part be due to a lack of exposed contacts between the complex and enclosing schists. If the swirled mixed breccia at the north end of Berniece Lake is a rheomorphic breccia, contact metamorphic conditions would have been at a temperature and volatile content high enough to have induced plasticity in the wallrock.

Allen (1942, p.136) reported the presence of amphibole in the contact of one hornfelsed xenolith (?) from the east end of Poohbah Lake which he interpreted to be due to metasomatism by the alkalic magma.

Mitchell (1976) reported that a post-cooling thermal event caused argon loss in the samples studied by him and he thought this loss was concomitant with strike-slip faulting within the area.

GEOCHRONOLOGY

Mitchell (1976) completed the first isotope study on the Poohbah Lake Alkalic Rock Complex in the K-Ar system. He obtained a K-Ar isochron age of 2706 ± 23 Ma on the alkalic rocks. Mitchell (1976) reported an apparent K-Ar age of 2550-2630 on granitic pegmatites which cut the Poohbah Lake Alkalic Rock Complex.

Bell *et al.* (1982) obtained an $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.70123 ± 0.00010 for the complex which indicates the presence of little crustal contamination.

In 1985, Dunlop completed paleomagnetic studies on the Poohbah Lake Alkalic Rock Complex and determined that the syenitic rocks were dominantly reverse-polarized. On the basis of paleomagnetic data Dunlop (1985) compared the Poohbah Lake data with that of 2630 Ma Matachewan diabase and suggested an approximate age of 2650 Ma for the Poohbah Lake intrusion.

Kwon (1986) obtained a Pb-Pb isochron age of 2667 ± 5 Ma using feldspar and apatite separates. He reported a Pb-Pb isotopic age of 2663 ± 17 Ma on just

apatite and an age of 2750 ± 180 Ma using just feldspar. Excluding one feldspar sample, an age of 2530 ± 280 Ma was obtained with an initial $^{208}\text{Pb}/^{204}\text{Pb}$ ratio of 13.539 ± 0.082 (MSWD = 33) which was interpreted to indicate a recent disturbance in the U-Pb system in the feldspars (Kwon 1986). Kwon (1986) suggested that the older K-Ar age of 2706 ± 23 Ma obtained by Mitchell (1976) is the result of excess radiogenic argon and that most likely the emplacement age is 2667 ± 5 Ma indicated by the Pb-Pb system.

A Pb-Pb isochron age of 2672 ± 8 Ma was obtained using leachates from the feldspars (Kwon 1986).

The Sm-Nd data from the Poohbah Lake Alkalic Rock Complex gave a poorly defined isochron (Kwon 1986).

Kwon (1986) reported an errorchron age of 2690 ± 210 Ma in the Rb-Sr system and an $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.701291. The Sr and Nd systems suggest isotopic heterogeneity which may be due to mantle heterogeneity even though some crustal contamination cannot be discounted (Kwon 1986).

The work by Kwon (1986) was done on samples 393, 403, 421, 435 and 436 (see Figure 3, back pocket).

The work by Kwon (1986), which also includes the late Archean alkaline rock complexes of Sturgeon Narrows and Otto Stock, gave similar isotopic ages on late Archean alkaline rock complexes. This observation suggests that the late Archean alkaline rock emplacement event took place simultaneously at widely separated areas within the Canadian Shield. Sage (1986) also suggested that the late Archean alkaline rock emplacement event within the Canadian Shield spanned a relatively narrow band of geologic time.

STRUCTURAL GEOLOGY

The Poohbah Lake Alkaline Rock Complex does not lie on any clearly recognizable fracture system as do most alkaline complexes (Heinrich 1966; Bailey 1974, p.148-160). Aeromagnetic maps (ODM-GSC 1961) of the area fail to disclose any clearly identifiable feature that could be unquestionably interpreted as a fault or rift structure. On a regional aeromagnetic compilation (ODM-GSC 1970) the complex lies along a north of east linear trend which may represent either a regional fault pattern or a lithologic trend. The author considers the aeromagnetic pattern to more likely reflect lithologic trends.

Trachytoidal texture, as defined by the preferred orientation of the feldspars, and rare mafic segregation bands, parallel the northeast elliptical elongation of the intrusion. Schistosity within the enclosing schists is conformable with the outline of the intrusion. The dips of the trachytoidal structure are steep along the flanks, but somewhat shallower towards the core. Dips within the schists are vertical along the north side, steeply dipping to the east along the west flank and steeply dipping to the north along the south flank. Inward-dipping trachytoidal foliations along the eastern margin of the complex, in conjunction with structural trends found in the wallrocks, suggest a funnel-shaped intrusive body. The trachytoidal textures are best developed in the mafic bands within the syenite.

The better developed subparallel orientation of the feldspar phenocrysts occurs within the mafic intercumulate material. Presumably the orientation of the feldspar phenocrysts results from liquid movement as a result of emplacement processes. That portion of the crystal mush containing the greater concentration of intercumulus liquid would support the least amount of stress and was thus liable to greater flow movement and better feldspar crystal alignment (Photo 4).



Photo 4. Deformation of mafic banding. Note the well-developed trachytoidal texture in mafic rich band compared to the more massive, leucocratic phase. Location P-8 on Figure 3.



Photo 5. Xenolith of schistose metasediments enveloped in tangentially oriented feldspar laths of coarse-grained syenite. Dark areas are due to shading by nearby trees. Location P-7 on Figure 3.

At one location on the north side of the most northern island in the northeast corner of Poohbah Lake and on a small water washed outcrop at the west end of Poohbah Lake, coarse-grained leucocratic syenite is cut by a ramifying network of mafic segregations, presumably representing the former accumulation of intercumulus liquid from the syenite. A thin section of one of these bands indicated that these bands are composed dominantly of clinopyroxene. The other minerals present are identical to those found in the mafic portions of the syenite rocks throughout the complex.

Rarely, a very well developed trachytoidal texture is developed marginal to wallrock xenoliths. The feldspars are oriented tangential to the xenolith. The best example of this feature was found on an island in the northeast corner of Poohbah Lake. A 12 cm diameter clast has a 4 cm wide rim of feldspars oriented tangentially to its margins (Photo 5). This feature likely resulted from the slow rotation of the xenolith in a viscous crystal mush.

Other evidence of magma movement was found at the north end of Berniece Lake. At this location complete balls or circular structures defined by the subparallel orientation of feldspar crystals in the more mafic portions of the syenite are present. The structures are approximately 2 m in diameter and have a very well developed trachytoidal texture. The author interprets these structures as being more fluid-rich vortices within the intruding magma.

Field evidence suggests that the body has been subjected to little tectonic activity and evidence for faulting or shearing is lacking. The greater number and larger size of xenoliths and blocks of wallrock towards the east implies that this side of the complex may represent a relatively higher level of exposure than the west. Mitchell and Platt (1978, Figure 1) indicate that a northwest-trending fault is present in the northeast corner of the complex. The author could not find field evidence for this fault. A second east-striking fault is indicated by Mitchell and Platt (1978, Figure 1) in a bay on the east side of Poohbah Lake. A linear can be placed at this location but lithologic offset needed to define a fault was not observed.

Linear structures in the schists are not uncommon and are represented by elongated clots of feldspar and quartz and streaky segregations of mica in the plane of foliation.

RECOMMENDATIONS FOR FUTURE STUDY

Additional mapping is needed in the southeast area of the complex. The brief petrographic examinations need to be supplemented by universal stage studies. Microprobe analyses are needed to more clearly define mineralogy. A U-Pb isotopic age is desirable.

Economic Geology

There is no record of mineral exploration activity on the complex in the Assessment Files Research Office of the Ontario Geological Survey. Trace to very minor amounts of pyrite occur in schistose inclusions of wallrocks, but sulphides are not visually identifiable in rocks of the complex. Apatite, estimated by the author to approach quantities of 10–15%, occurs as an accessory component to the more mafic (malignitic) phases. The apatite content is highly variable and the complex is not likely to contain economic concentrations of this mineral.

RECOMMENDATIONS TO THE PROSPECTOR

The complex lies within the boundaries of the Quetico Provincial Park and sampling of the outcrops as well as flying into the area requires permission of the Director of Parks and Recreational Areas, Ontario Ministry of Natural Resources. The area is closed to staking.

Appendix A — Petrographic Descriptions, Chemical Analyses, Normative Compositions, and Statistical Compositions of Lithologic Units of the Poohbah Lake Alkalic Rock Complex.

TABLE A-1. PETROGRAPHIC AND FIELD DESCRIPTIONS OF
WHOLE-ROCK SAMPLES* FROM THE POOHBAB LAKE ALKALIC ROCK
COMPLEX.

Reference No. 390

Sample No. PR1-25

Biotite, pyroxene syenite.

Field Description. Coarse grained, inequigranular, porphyritic, trachytoidal. Weathered surfaces are mottled pinkish grey and black. The outcrop is cut by coarse-grained granite pegmatite. Fresh surfaces are mottled pinkish grey and black. Map Unit 2d.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Biotite forms bright green to brown booklets enclosing subhedral to almost euhedral clinopyroxene. Perthite is a string to patch perthite. Minor anhedral, interlocking plagioclase grains occur marginal to perthite.

Reference No. 391

Sample No. PR1-30B

Pyroxene, biotite, garnet syenite.

Field Description. Coarse grained, inequigranular, porphyritic, weakly trachytoidal. Weathered and fresh surfaces are mottled pinkish grey and black. Several small, fine-grained, mafic xenoliths are present in outcrop. The sample is homogeneous. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Garnet forms light yellow-brown, irregular grains, interlocking and forming a composite mosaic with minor olivine and pyroxene. Biotite forms large anhedral booklets interstitial to and marginal to the other mafic minerals. Plagioclase forms an interlocking mosaic of grains interstitial to perthite. Larger grains of plagioclase have a protoclastic texture. Perthite is stringy with some Carlsbad twins.

Reference No. 392

Sample No. PR3-5

Garnet, biotite, pyroxene syenite.

Field Description. Coarse grained, inequigranular, porphyritic, trachytoidal. Feldspar crystals are up to 5 cm across and zoned with blue-grey cores and pinkish grey rims. Weathered surfaces are mottled bluish grey and black. Map Unit 2e.

Petrographic Description. Medium to coarse grained, inequigranular-seriate, hypidiomorphic. Biotite forms distinct grains between pyroxene. Clinopyroxene is euhedral to subhedral with some mottled extinction. Plagioclase is albite (An8), forming tiny grains between perthite grains and mantles on perthite. Perthite is a string to patch perthite, forming large, anhedral grains.

Reference No. 393

Sample No. PR3-8

Malignite.

Field Description. Medium grained, massive, equigranular. Pitting on weathered surface suggests presence of nepheline. Weathered surfaces are dark grey to grey-black, fresh surfaces greenish black. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Nepheline forms euhedral crystals and is interstitial to other minerals. Pyroxene is euhedral to subhedral

*All samples are from outcrops. Reference numbers for samples are plotted on Figure 3 (Chart A).

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clinopyroxene. Biotite forms large grains partially enclosing pyroxene. Apatite is poikilitic in pyroxene and forms large anhedral crystals marginal to pyroxene. Orthoclase forms anhedral grains.

Reference No. 394
Sample No. PR3-10

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered surfaces are dark grey to grey-black, fresh surfaces greenish black. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Biotite forms large grains partially enclosing pyroxene. Feldspar forms anhedral grains. Nepheline appears to fill fractures and replace in a patchy fashion some of the potassium feldspar. Pyroxene is euhedral to subhedral clinopyroxene. Minor apatite, garnet, and sphene are present.

Reference No. 395
Sample No. PR3-11

Malignite.

Field Description. Medium to coarse grained, equigranular, massive. Weathered surfaces are mottled pinkish grey and dark greenish black; fresh surfaces are bluish grey and greenish black. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, hypidiomorphic. Nepheline forms anhedral masses between potassium feldspar grains and patches in potassium feldspar. Pyroxene forms euhedral to subhedral grains of clinopyroxene. Orthoclase forms anhedral grains with curved to lobate grain boundaries. Minor apatite and biotite are present.

Reference No. 396
Sample No. PR3-16

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered surfaces are dark grey to greyish black, fresh surfaces greenish black. Feldspars occur as large, optically continuous grains up to 2-3 cm across, poikilitically containing pyroxene. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Nepheline forms irregular, interstitial grains. Pyroxene is a euhedral to anhedral clinopyroxene. Orthoclase forms irregular, anhedral grains with curved to straight grain boundaries. Garnet forms tiny grains outlining former pyroxene grains and enclosing biotite booklets. Sericite replaces nepheline.

Reference No. 397
Sample No. PR3-17

Malignite.

Field Description. Medium grained, massive, equigranular. Weathered surfaces are dark grey to greenish black, fresh surfaces dark greenish black. A poorly developed foliation is flay lying. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Brown garnet is interstitial to pyroxene. Biotite is intergranular to pyroxene. Pyroxene is a euhedral to subhedral clinopyroxene. Nepheline is interstitial to feldspar and pyroxene and also occurs as myrmekitic intergrowth with potassium feldspar, possibly pseudoleucite. Potassium feldspar has anhedral grains with curved to lobate grain boundaries.

Reference No. 398 (no analysis)
Sample No. PR3-31

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular, well developed trachytoidal texture. Feldspar phenocrysts up to 11 cm across display excellent concentric zoning. Feldspars have a seriate distribution. Weathered and fresh surfaces are mottled pinkish grey and dark green. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Pyroxene is a ragged aegirine-augite altering to biotite and epidote(?). Perthite forms large anhedral grains with well developed stringy texture. Biotite and epidote (?) form an interlocking mosaic of grains.

Reference No. 399**Sample No. PR4-15***Pyroxene syenite.*

Field Description. Medium to coarse grained, massive, equigranular, trachytoidal. Weathered and fresh surfaces are mottled pale pink and greenish black. Some xenoliths of wallrock are up to 25 cm in maximum length. Sample is fresh and homogeneous. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Euhedral to subhedral grains of pyroxene are zoned. Locally pyroxene is altered to light green hornblende. Perthite forms large anhedral grains with Carlsbad twins. Perthite is a string perthite. Plagioclase (An8) forms interstitial anhedral grains between perthite grains. Minor sphene is present.

Reference No. 400**Sample No. PR4-22***Amphibole, pyroxene syenite.*

Field Description. Medium to coarse grained, massive, equigranular, trachytoidal. Weathered surfaces are bluish grey, fresh surfaces mottled bluish grey and greenish black. The rock contains 40-50% mafics. Map Unit 2d, transitional to Map Unit 2e.

Petrographic Description. Fine to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Stringy perthite forms large subhedral grains. Amphibole forms irregular, ragged grains partially enclosing clinopyroxene. Sphene forms euhedral wedge-shaped crystals. Biotite crystals form discrete booklets. Pyroxene is euhedral to subhedral with green pleochroism.

Reference No. 401**Sample No. PR4-24***Amphibole pyroxene syenite.*

Field Description. Medium to coarse grained, massive, inequigranular, porphyritic, trachytoidal. Weathered and fresh surfaces are mottled pale pink and dark greenish black. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Patch and string perthite form subhedral grains. Minor amphibole occurs interstitial to pyroxene. Biotite occurs as books interstitial to pyroxene. Clinopyroxene forms anhedral to subhedral grains. Plagioclase (An6) forms small anhedral grains between larger perthite grains. Minor sphene is present.

Reference No. 402**Sample No. PR4-27***Garnet, biotite, pyroxene syenite.*

Field Description. Medium to coarse grained, massive, inequigranular, porphyritic, trachytoidal. Weathered and fresh surfaces are mottled pale pink and dark greenish black. Several mafic xenoliths are up to 15 cm in diameter. Sample is fresh and homogeneous. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase forms anhedral grains interstitial to perthite. Sphene forms wedge-shaped crystals. Small composite grains of garnet form a mesh surrounding euhedral to subhedral crystals of clinopyroxene. Biotite occurs as books enclosing pyroxene, apatite, and sphene. Stringy perthite forms subhedral grains. Microcline occurs as anhedral, small, interstitial grains.

Reference No. 403**Sample No. PR4-33***Amphibole, pyroxene syenite.*

Field Description. Medium to coarse grained, inequigranular-porphyritic, trachytoidal. Weathered and fresh surfaces are mottled pale pink and dark greenish black. Several small, rounded, mafic xenoliths were observed in outcrop. Sample is fresh and homogeneous. Map Unit 2d.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase forms interstitial to perthite and rims perthite. Amphibole forms large dark green grains; several have anomalously high extinction. Perthite forms subhedral grains with stringy texture. Pyroxene is a euhedral to subhedral clinopyroxene. Minor sphene is present.

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Reference No. 404

Sample No. PR4-37

Malignite.

Field Description. Medium to coarse grained, weakly foliated. Weathered surfaces are grey black, fresh surfaces greenish grey-black. Map Unit 2f.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Biotite forms large irregular grains partially enclosing pyroxene. Garnet forms yellow-brown, irregular composite grains in association with biotite and rimming pyroxene. Clinopyroxene forms ragged crystals with some biotite and apatite inclusions. Nepheline occurs as a patchy replacement of perthite. Perthite forms subhedral grains with moderate development of stringy perthite and weak suggestions of quadrille twinning of microcline.

Reference No. 405

Sample No. PR4-39

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered surfaces are grey black, fresh surfaces greenish grey black. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Garnet forms irregular, light yellow-brown composite grains. Garnet is associated with biotite, and both envelope pyroxene. Clinopyroxene is anhedral. Minor microcline has well developed quadrille twinning. Orthoclase has mottled extinction. Potassium feldspars are anhedral.

Reference No. 406

Sample No. PR5-1

Amphibole pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, weakly trachytoidal. Weathered surfaces are mottled pink with red and medium green. Fresh surfaces are mottled pink and green. Phenocrysts of feldspar up to 8 cm across, in seriate distribution, display well developed concentric or oscillatory zoning. Map Unit 2b.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene is euhedral to subhedral. Amphibole is strongly pleochroic in brown and green; it rims and replaces pyroxene. Plagioclase (An8) forms small anhedral grains and large grains undergoing patchy replacement. Large grains are weakly protoclastic. Perthite is stringy and locally a patchy replacement of plagioclase.

Reference No. 407

Sample No. PR5-9

Biotite aegirine-augite syenite.

Field Description. Medium to coarse grained, inequigranular, weakly trachytoidal. Weathered surfaces are mottled pink and black, fresh surfaces pink and dark greenish black. Map Unit 2d, transitional to Map Unit 2f.

Petrographic Description. Medium grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An10) rims perthite and occurs as small anhedral grains interstitial to pyroxene. Clinopyroxene forms euhedral to subhedral grains. Perthite forms subrounded grains with well developed stringy texture. Patch perthite may be a replacement of large plagioclase grains. Minor garnet occurs as small grains intergranular to pyroxene.

Reference No. 408

Sample No. PR5-12A

Aegirine-augite syenite (mafic).

Field Description. Medium to coarse grained, inequigranular-porphyritic, trachytoidal. Weathered and fresh surfaces are mottled pink and greenish black. Feldspars have blue grey cores and pinkish tinted rims. Outcrop contains a 1 by 1 cm block of wallrock. Transitional into Unit 2d. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene forms euhedral to subhedral grains. Potassium feldspar is probably orthoclase but has undergone extensive saussuritization. Plagioclase (An5) forms small anhedral grains and large grains undergoing patchy potassium feldspar replacement. Apatite, sphene and magnetite are common accessories. Minor chlorite is present.

Reference No. 409

Sample No. PR5-23A

Biotite, garnet syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, weakly trachytoidal. Phenocrysts of feldspar are up to 3.5 cm in length. Weathered and fresh surfaces are pinkish

grey-black. Outcrop is cut by coarse-grained microcline pegmatite, possibly related to the Poohbah Lake complex. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Microcline forms large grains with vestiges of plagioclase and occurs as small, anhedral, interstitial grains. Anhedral yellow-brown garnet is associated with books of biotite and euhedral sphene. Plagioclase (An₄) forms large grains partially replaced by potassium feldspar and rims on microcline. Plagioclase also occurs as anhedral, interstitial grains.

Reference No. 410

Sample No. PR5-27A

Biotite syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, weakly trachytoidal. Weathered and fresh surfaces are mottled pinkish grey and greenish black. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Microcline forms large grains with vestiges of plagioclase and anhedral, interlocking, interstitial grains. Plagioclase forms large grains replaced by potassium feldspar and small, anhedral, interlocking, interstitial grains. Biotite forms interlocking booklets. Minor euhedral sphene and apatite are present.

Reference No. 411

Sample No. PR5-28

Nepheline-bearing biotite pyroxenite.

Field Description. Medium grained, equigranular, weakly schistose. Weathered and fresh surfaces are black with grey spots. Biotite makes up 20% of the rock. Total mafics comprise 60% or more of rock. Map Unit 2c.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Biotite forms large books, often with bent (001) cleavage. Pyroxene forms euhedral to subhedral grains of clinopyroxene. Former nepheline(?) is irregular, interstitial with radiating habit, possibly a zeolite after nepheline.

Reference No. 412

Sample No. PR6-2

Biotite, pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-seriate, weakly trachytoidal. Some feldspar phenocrysts are up to 8 mm. Larger feldspars are poikilitic with pyroxene grains enclosed. The outcrop contains several 3-7 cm long mafic xenoliths. Sample fresh and homogeneous. Map Unit 2d.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene forms euhedral to subhedral grains. Apatite is generally euhedral but large, interstitial grains are anhedral. Trace amounts of interstitial carbonate were noted. Plagioclase (An₁₄) forms anhedral, interlocking mosaics of crystals enclosing perthite, and is possibly protoclastic. Microcline forms large grains and almost imparts a porphyritic texture to the rock. Local vestiges of plagioclase are associated with microcline and some stringy perthite is present.

Reference No. 413

Sample No. PR6-9

Pyroxene syenite.

Field Description. Coarse grained, inequigranular, trachytoidal. Phenocrysts of feldspar are zoned and have a maximum length of 5 cm. Weathered and fresh surfaces are mottled pink and dark green. Sample is homogeneous. Map Unit 2k.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Perthite forms large grains with well developed stringy textures. Perthite contains vestiges of plagioclase. Plagioclase (An₈) forms an interlocking, mosaic of anhedral grains interstitial to larger perthite grains. Pyroxene is euhedral to anhedral in outline and is an aegirine-augite. Locally there is very minor alteration of pyroxene to a bright green amphibole with a high extinction angle. The amphibole is possibly a sodic amphibole, arfvedsonite or barkevikite.

Reference No. 414

Sample No. PR6-13

Amphibole, pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic. Phenocrysts of feldspar up to 9 cm across appear somewhat hialal with medium grained groundmass. Several small

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rounded mafic xenoliths were noted in outcrop. Feldspar crystals are concentrically zoned. Map Unit 2k.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Pyroxene forms subhedral to euhedral crystals of clinopyroxene. Cores of crystals are often pale with deeper green rims. Amphibole is dark green and in part replaces pyroxene; high extinction angle suggests sodic variety arfvedsonite or barkevikite. Plagioclase is anhedral, interstitial to perthite. Perthite is in part microcline, has well developed stringy texture; locally extinction is mottled and crystal stressed.

Reference No. 415

Sample No. PR8-14

Amphibole pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, trachytoidal. Weathered surfaces are mottled pink and dark green, fresh surfaces pink and dark green. Map Unit 2k.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Biotite forms booklets with amphibole and possibly replacing amphibole. Pyroxene is subhedral to euhedral clinopyroxene. Plagioclase (An12) forms a mosaic of anhedral grains interlocking with microcline, and also forms a patch perthite; large subhedral grains have well developed stringy perthite texture.

Reference No. 416

Sample No. PR8-37

Pyroxenite.

Field Description. Medium grained, equigranular, massive. Weathered and fresh surfaces are black. Map Unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Apatite forms euhedral poikilitic inclusions in pyroxene and large anhedral grains interstitial to pyroxene. Pyroxene is a subhedral to euhedral clinopyroxene. The rock contains large euhedral twinned sphene crystals. Carbonate occurs interstitial to pyroxene and as inclusions in sphene. Plagioclase (An8) forms irregular, anhedral, interstitial grains. Dark green sodic amphibole is after pyroxene.

Reference No. 417

Sample No. PR8-1

Garnet, biotite, pyroxene syenite.

Field Description. Very coarse grained, inequigranular-porphyritic, trachytoidal. Euhedral, concentrically zoned feldspar phenocrysts are up to 9 cm long. Weathered and fresh surfaces are mottled with bluish grey feldspars in greenish black matrix. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Garnet is yellow-brown and forms an anastomosing network of grains. Clinopyroxene forms ragged, poikilitic grains with abundant inclusions of biotite and garnet. Plagioclase (An10) forms along margins of perthite grains, in part interstitially. Perthite forms large phenocrysts with Carlsbad twinning and abundant vestiges of albite twinning; margins of grains are ragged. Biotite is anhedral and intergranular with pyroxene and garnet.

Reference No. 418

Sample No. PR8-3

Amphibole, aegirine-augite syenite.

Field Description. Very coarse grained, inequigranular-porphyritic, strongly trachytoidal. Euhedral feldspars are concentrically zoned. Weathered surfaces are mottled with bluish grey feldspar in greenish black matrix. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Biotite forms euhedral books interstitial to pyroxene. Amphibole is a bright green sodic amphibole partially replacing pyroxene. Apatite is euhedral where poikilitic in pyroxene, anhedral where forming large intergranular grains. Perthite forms large grains with stringy texture and ragged edges. Plagioclase (An10) forms an interlocking mosaic of anhedral grains between perthite and some pyroxene grains. Plagioclase is weakly protoclastic.

Reference No. 419 (no analysis)

Sample No. PR8-18

Biotite, amphibole, garnet, pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, massive. Phenocrysts of feldspar are slightly hiatal with groundmass. Weathered surfaces are grey, fresh surfaces mottled pinkish grey and greenish black. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An5) forms anhedral, interstitial grains which are partially saussuritized and locally rim perthite. Perthite forms large grains with stringy texture, well developed Carlsbad twins and ragged outlines. Biotite is interstitial to pyroxene. Bright green sodic amphibole is after clinopyroxene. Pyroxene is euhedral to subhedral in outline. Garnet is yellow-brown, anhedral and intergranular with pyroxene. Euhedral sphene is present.

Reference No. 420

Sample No. PR8-18A

Biotite, garnet, pyroxene syenite.

Field Description. Very coarse grained, massive, inequigranular-porphyritic. Feldspars are zoned and trachytoidal. Weathered and fresh surfaces are mottled with bluish grey feldspars in greenish black matrix. The rock contains more feldspar than usual for Map Unit 2e. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Sphene is euhedral. Garnet forms an anastomosing network enclosing sphene and pyroxene. Biotite forms large, irregular crystals enclosing pyroxene, garnet and apatite. Pyroxene is euhedral clinopyroxene. Carbonate is interstitial. Feldspar forms large grains of string perthite microcline with ragged edges. Carlsbad twinning is present. Plagioclase (An16) is weakly protoclasic, and forms an anhedral, interlocking mosaic enclosing and rimming perthite. Vestiges of albite twinning remain in perthite.

Reference No. 421

Sample No. PR8-30

Biotite, amphibole, pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, weakly trachytoidal. The outcrop contains a mafic xenolith. Weathered surfaces are grey to buff, fresh surfaces pinkish grey to buff. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An8) forms an interlocking mosaic of anhedral grains marginal to perthite and rimming perthite. Microcline is anhedral and interstitial. Perthite forms large, subhedral grains with ragged edges and vestiges of albite twinning. Clinopyroxene is euhedral to anhedral. Amphibole is highly pleochroic in green, replaces pyroxene and is likely sodic. Amphibole is possibly arfvedsonite or barkevikite. Biotite forms irregular grains enclosing pyroxene and minor apatite.

Reference No. 423

Sample No. PR8-42

Garnet, biotite syenite.

Field Description. Coarse grained, equigranular, porphyritic, trachytoidal. Weathered surfaces are grey, fresh surfaces pinkish grey. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Garnet is yellow-brown, anhedral and closely associated with biotite. Biotite forms anhedral grains. Plagioclase (An7) forms an interlocking anhedral mosaic enclosing perthite; larger grains show patchy replacement with potassium feldspar and are protoclasic. Perthite forms larger grains with some quadrille twinning of microcline and vestiges of albite twinning. Minor sphene is present.

Reference No. 424

Sample No. PR8-44

Pyroxene, amphibole, nepheline syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic. Weathered surfaces are pitted and dark grey; fresh surfaces are dark grey mottled with white. Map Unit 2m.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Perthite displays well developed stringy texture; crystals are zoned. Nepheline forms subhedral to rounded blebs in perthite grains, altered in part, to sericite. Amphibole is a dark green, after pyroxene. Pyroxene forms ragged grains of clinopyroxene, altering to amphibole. Microcline perthite is also present. Accessory sphene and apatite were noted.

Reference No. 425

Sample No. PR8-45

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered and fresh surfaces are mottled grey and greenish black. Map Unit 2f.

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Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Nepheline occurs as round blebs of myrmekite in orthoclase and as irregular areas of myrmekite between pyroxene grains, possibly as a pseudoleucite relationship. Clinopyroxene is euhedral to subhedral; larger grains display distinct zoning from colourless cores to green rims. Orthoclase is anhedral and interstitial. Minor sphene and apatite are present.

Reference No. 426

Sample No. PR10-12

Garnet, biotite, pyroxene syenite.

Field Description. Very coarse to medium grained, inequigranular-porphyrritic. Outcrop is strongly trachytoidal with feldspars up to 5 cm long. Bluish grey concentrically zoned feldspars are set in a dark green, medium grained groundmass. Fresh surfaces are the same as weathered surface with pinkish feldspars. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyrritic-seriate, hypidiomorphic. Garnet forms anhedral grains distributed in a mesh-like fashion enclosing pyroxene and associated with biotite. Clinopyroxene is subhedral to anhedral with poikilitic biotite. Apatite is poikilitic in pyroxene and forms large, anhedral, interstitial grains. Plagioclase (An11) is interstitial to the perthite and large grains are undergoing patchy replacement. Perthite is patchy with scattered vestiges of albite twinning.

Reference No. 427

Sample No. PR10-14

Malignite.

Field Description. Medium grained, equigranular, weakly foliated. Weathered surfaces are mottled buff and black, fresh surfaces pinkish buff and greenish black. Map Unit 2f.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyrritic-seriate, hypidiomorphic. Garnet forms dark brown, anhedral grains. Biotite forms booklets commonly associated with garnet. Clinopyroxene forms irregular, ragged anhedral grains partially enclosed by garnet on occasion. Nepheline may be present as highly altered (sericite) grains, interstitial to the feldspar. Perthite forms large and small grains, generally clear with faint vestiges of albite twinning.

Reference No. 428

Sample No. PR10-17

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyrritic. Weathered surfaces are bluish grey, fresh surfaces mottled bluish grey with buff to white groundmass. Map Unit 2m.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyrritic-seriate, hypidiomorphic. Orthoclase forms tabular crystals with Carlsbad twinning and is interstitial to larger perthite. Perthite forms larger grains with stringy texture. Clinopyroxene forms euhedral to anhedral crystals. Nepheline (?) forms highly altered (sericite) grains interstitial to the feldspar.

Reference No. 429

Sample No. PR10-19

Malignite.

Field Description. Medium grained, equigranular, trachytoidal. Weathered and fresh surfaces are mottled greenish black and grey. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, trachytoidal, hypidiomorphic. Nepheline is interstitial and highly altered, possibly to a zeolite. Clinopyroxene forms euhedral to subhedral crystals commonly zoned from colourless cores to green rims. Orthoclase forms clear tabular crystals with well developed Carlsbad twinning and strong preferred orientation. Biotite forms books, and may possibly result from the alteration of pyroxene. Apatite is euhedral and poikilitic in pyroxene.

Reference No. 430

Sample No. PR10-52

Amphibole pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyrritic-seriate. Weathered surfaces are buff to pale pink, fresh surface pink. No obvious trachytoidal texture. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyrritic-seriate, hypidiomorphic. Pyroxene forms euhedral to subhedral grains of clinopyroxene. Amphibole

bole is a dark green sodic amphibole, replaces pyroxene, and probably is arfvedsonite or barkevikite. Minor, dark brown garnet is associated with pyroxene. Plagioclase occurs as anhedral grains interstitial to larger grains of string perthite. Some grains have quadrille twinning of microcline.

Reference No. 432

Sample No. PR17-6

Biotite, amphibole, clinopyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic. Phenocrysts of feldspar are zoned concentrically. Map Unit 2d, transitional to 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Amphibole is a dark green sodic amphibole replacing and interstitial to pyroxene. Pyroxene is subhedral to anhedral clinopyroxene. Plagioclase (An14) forms anhedral, grains marginal to larger perthite grains. Perthite forms anhedral interstitial grains with stringy texture and local vestiges of albite twinning. Carbonate is interstitial and disseminated throughout rock, and could be primary. Sphene and apatite are abundant accessories.

Reference No. 433

Sample No. PW4-2

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered surfaces are black, fresh surfaces mottled greenish black and grey. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Nepheline forms irregular interstitial patches, some with partial euhedral outline. Clinopyroxene is euhedral to subhedral. Biotite forms interstitial books. Orthoclase forms anhedral, irregular grains. Minor apatite and garnet are present. Nepheline is altered to sericite.

Reference No. 434

Sample No. PW4-5

Malignite.

Field Description. Medium grained, equigranular, massive. Weathered surfaces are mottled greenish black and grey, fresh surfaces mottled greenish black and buff. Map Unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Biotite forms small booklets in part after pyroxene and also as large interlocking crystals. Garnet forms small composite grains rimming pyroxene. Orthoclase forms an interlocking mosaic of crystals with weak suggestion of quadrille twinning of microcline. Pyroxene forms anhedral to subhedral crystals.

Reference No. 435

Sample No. PW5-35

Biotite, garnet syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic. Weathered surfaces are brown, fresh surfaces mottled bluish grey with pink to buff rims on feldspar crystals. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Garnet forms yellow brown, anhedral grains with biotite. Biotite forms large irregular books with sphene and rare zircon inclusions. Zircons have dark radioactive bombardment halos within enclosing biotite. Plagioclase (An8) forms anhedral grains interstitial to larger microcline grains, and rims some microcline. Microcline forms large anhedral grains with local vestiges of albite twinning. Anhedral microcline forms part of an interlocking mosaic with plagioclase, which is interstitial to larger microcline grains.

Reference No. 436

Sample No. XPW5-26

Amphibole, pyroxene syenite.

Field Description. Coarse grained, inequigranular, massive, porphyritic. Weathered surfaces are buff, fresh surfaces buff to pinkish buff. Map Unit 2d.

Petrographic Description. Fine to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Apatite is euhedral to anhedral. Amphibole is irregular shaped and sodic, possibly arfvedsonite or barkevikite; it replaces pyroxene. Biotite forms books interstitial to clinopyroxene. Perthite forms subhedral to anhedral grains. Larger perthite grains form phenocrysts and smaller grains occur interstitial to phenocrysts.

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Reference No. 437

Sample No. PW9-27

Amphibole, pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic. A mafic dike (?) cuts the outcrop and several mafic inclusions are present. Weathered surfaces are buff to pinkish buff, fresh surfaces mottled pink and greenish black. Map Unit 2d.

Petrographic Description. Medium grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Dark green, strongly pleochroic, sodic amphibole replaces pyroxene. Amphibole is possibly arfvedsonite or barkevikite. Pyroxene is a euhedral to anhedral clinopyroxene. Perthite texture is strongly developed in large, ragged phenocrysts and smaller, anhedral grains which occur between larger perthite grains. Plagioclase (An₁₂) forms anhedral grains in an interlocking mosaic with microcline. The plagioclase and microcline are interstitial to larger perthite grains.

Reference No. 438

Sample No. PW9-43

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic, trachytoidal with feldspar crystals up to 3 cm in length. Weathered surfaces are grey, fresh surfaces mottled blue grey and greenish black. Outcrop is transitional to Map Unit 2c. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Perthite forms large twinned, anhedral grains with ragged edges. Dark green, sodic amphibole replaces clinopyroxene. Sphene occurs as euhedral wedge-shaped crystals. Pyroxene is euhedral to anhedral in outline.

Reference No. 439

Sample No. PW10-1

Amphibole, pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic, well developed trachytoidal textures. Feldspars display concentric zoning. Several mafic xenoliths are present in outcrop. Weathered surfaces are mottled black and buff, fresh surfaces pinkish grey and greenish black. Outcrop transitional to Map Unit 2d. Map Unit 2e.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Apatite is euhedral, poikilitic in pyroxene. Amphibole is a dark green sodic variety replacing pyroxene. Pyroxene is a euhedral to subhedral clinopyroxene. Perthite forms subhedral to anhedral grains with a stringy perthite texture, and well developed quadrille twinning of microcline. Biotite is minor and replaces amphibole.

Reference No. 440

Sample No. PW10-6

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic, weakly trachytoidal. Feldspar laths up to 5 cm long display concentric zoning. Map Units 2d and 2c are intermixed. Several mafic xenoliths are present in outcrop. Map Unit 2a.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Apatite occurs as poikilitic euhedral grains in pyroxene. Clinopyroxene forms euhedral to subhedral grains. Perthite is a well developed string perthite with local vestiges of albite twinning. Larger perthite grains are enclosed by similar appearing perthite. Euhedral, wedge-shaped sphene is present.

Reference No. 441

Sample No. PW11-10

Amphibole, pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular, porphyritic, trachytoidal. Weathered and fresh surfaces are buff. Map Unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Amphibole replaces pyroxene and is a dark green pleochroic sodic variety possibly barkevikite or arfvedsonite. Plagioclase (An₇) forms anhedral grains marginal to perthite and occurs as large crystals undergoing patchy replacement by potassium feldspar. Perthite is anhedral in outline, has vestiges of albite twinning and some grains have quadrille twinning of microcline. Clinopyroxene is euhedral to subhedral.

Reference No. 442**Sample No. PW11-17***Amphibole, pyroxene syenite.*

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic. Weathered surfaces are reddish brown, fresh surfaces red. Map Unit 2b.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Amphibole forms irregular, dark green grains mantling and replacing pyroxene. Clinopyroxene forms euhedral to subhedral grains. Plagioclase (An5) forms anhedral grains interstitial to perthite. Perthite forms large grains with well developed stringy texture. Some perthite grains display vestiges of albite twinning. Sphene and apatite are common accessories.

Reference No. 443**Sample No. PR1-3B***Biotite, pyroxene syenite.*

Field Description. Coarse grained, equigranular, weakly trachytoidal. The outcrop contains scattered xenoliths of biotite, quartz, feldspar schist. Weathered surfaces are white to buff, fresh surfaces pinkish buff. Map Unit 2d.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene is subhedral to euhedral. Biotite is a deep green in colour and encloses the pyroxene. Plagioclase forms tiny interstitial grains. Perthite forms large, Carlsbad-twinned grains with patchy and stringy textures. Minor apatite, magnetite and sphene are present.

Reference No. 444**Sample No. PW18-10***Pyroxene, garnet, biotite syenite.*

Field Description. Medium to coarse grained, inequigranular-porphyritic, trachytoidal. Feldspars are concentrically zoned. Weathered surfaces are mottled buff and dark green, fresh surfaces mottled pinkish grey and greenish black. Map Unit 2e.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Garnet forms yellow brown, anhedral grains, in part outlining pyroxene and feldspar, thus forming a mesh. Clinopyroxene forms rounded grains in association with biotite. Sphene occurs as large, wedge-shaped crystals. Biotite forms large books in association with sphene and garnet. Plagioclase (An8) forms interlocking, interstitial grains with microcline. Perthite is stringy and has local areas of albite twinning.

Reference No. 445**Sample No. PWA-3***Pyroxene syenite.*

Field Description. Medium grained, equigranular, massive. Locally grain size is coarser. Mafics make up about 40% of rock and display local discontinuous concentrations. Weathered surfaces are buff, fresh surfaces pink to red. Sample is homogeneous. Map Unit 2a.

Petrographic Description. Medium to coarse grained, massive, allotriomorphic to hypidiomorphic. Plagioclase (An5) forms anhedral, interstitial grains. Clinopyroxene forms subhedral to anhedral grains. Sphene forms sharp euhedral crystals. Perthite forms subhedral grains with stringy perthite texture, and locally with quadrille twinning of microcline and vestiges of albite twinning.

Reference No. 446**Sample No. PWA-6B***Amphibole, pyroxene syenite.*

Field Description. Medium grained, equigranular, massive. Weathered surfaces are buff, fresh surfaces pink to red. Map Unit 2a.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Perthite forms both patchy and stringy perthite types. Both quadrille twinning and vestiges of albite twinning are present in perthite. Amphibole is a dark green, pleochroic, sodic variety, possibly arfvedsonite or barkevikite. Pyroxene forms subhedral to anhedral grains interlocking with, and being replaced by, amphibole. Pyroxene is a clinopyroxene. Euhedral sphene is abundant.

Reference No. 447**Sample No. PWA-7***Amphibole syenite.*

Field Description. Medium grained, equigranular, massive. Weathered surfaces are buff, fresh surfaces pink to red. Map Unit 2a.

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE

Petrographic Description. Medium grained, equigranular, massive, allotriomorphic, with curved to lobate grain boundaries. Amphibole forms anhedral to subhedral crystals of sodic composition, probably arfvedsonite or barkevikite. Perthite forms subhedral to anhedral grains with stringy to patchy perthite texture; there is some suggestion of quadrille twinning of microcline. Plagioclase (An6) forms anhedral crystals, interstitial to the perthite. Euhedral sphene is abundant.

Reference No. 448

Sample No. PWA-32

Pyroxene, amphibole syenite.

Field Description. Medium grained, massive, equigranular. Weathered surfaces are buff, fresh surfaces buff. Map Unit 2a.

Petrographic Description. Medium grained, inequigranular-porphyritic-seriate, massive, allotriomorphic, with curved to lobate grain boundaries. Clinopyroxene forms ragged subhedral grains altering to dark green amphibole. Amphibole is dark green, strongly pleochroic, and is possibly arfvedsonite or barkevikite. Plagioclase (An14?) forms anhedral crystals interstitial to the larger perthite grains and it also rims some perthite grains. Perthite grains have ragged outlines and are enclosed in an interlocking mosaic of finer-grained, anhedral plagioclase and microcline. Sphene occurs as euhedral wedge-shaped crystals. Minor apatite is present.

TABLE A-2. MAJOR ELEMENT ANALYSES (WEIGHT PERCENT) OF WHOLE-ROCK SAMPLES FROM THE POOHBAH LAKE ALKALIC ROCK COMPLEX.

Ref. No.	Unit 2A					Unit 2B	
	445	446	447	448	440	442	406
SiO ₂	56.60	52.10	56.70	57.20	56.20	57.40	56.20
Al ₂ O ₃	14.40	13.80	17.20	15.90	15.00	16.20	15.90
Fe ₂ O ₃	3.20	3.38	2.11	2.09	2.64	1.13	2.56
FeO	2.74	4.32	3.07	2.66	2.32	3.32	2.91
MgO	2.59	3.68	2.12	2.35	2.92	1.72	2.85
CaO	6.75	8.98	4.08	5.20	7.21	4.09	5.93
Na ₂ O	4.83	3.88	4.75	4.46	4.42	4.76	4.47
K ₂ O	4.91	4.27	6.27	6.01	5.70	6.58	5.80
TiO ₂	0.79	1.04	0.81	0.88	0.81	0.71	0.83
P ₂ O ₅	1.00	1.48	0.71	0.93	0.87	0.52	0.88
S	0.03	0.12	0.05	0.10	0.10	0.01	0.03
MnO	0.11	0.12	0.09	0.08	0.09	0.08	0.09
CO ₂	0.24	0.22	0.24	0.26	0.28	0.26	0.24
H ₂ O+	0.30	0.26	0.71	0.44	0.18	0.12	0.06
H ₂ O-	0.44	0.42	0.43	0.41	0.47	0.47	0.44
Total	98.9	98.0	99.3	98.9	99.0	97.4	99.2

Ref. No.	Unit 2C		Unit 2D				
	411	435	437	438	441	436	390
SiO ₂	44.90	56.70	55.60	56.50	54.30	51.70	54.80
Al ₂ O ₃	10.10	17.90	15.80	15.50	14.50	13.20	15.00
Fe ₂ O ₃	3.52	1.87	2.74	2.55	3.97	3.78	3.90
FeO	5.48	1.83	2.91	2.49	2.41	3.98	2.49
MgO	10.50	2.25	2.65	2.74	3.25	4.98	3.45
CaO	13.40	3.65	5.68	5.90	7.24	9.45	6.58
Na ₂ O	2.66	4.61	3.91	4.41	3.52	3.45	4.16
K ₂ O	3.29	6.87	6.33	6.14	6.22	5.03	5.57
TiO ₂	1.14	0.86	0.77	0.80	0.74	0.90	0.96
P ₂ O ₅	0.99	0.67	0.84	0.88	1.00	1.30	0.97
S	0.10	0.02	0.03	0.03	0.04	0.06	0.02
MnO	0.15	0.07	0.09	0.08	0.12	0.14	0.11
CO ₂	0.30	0.26	0.34	0.22	0.32	0.24	0.24
H ₂ O+	1.62	0.23	0.58	0.06	0.34	0.45	0.06
H ₂ O-	0.63	0.41	0.44	0.41	0.54	0.47	0.44
Total	98.8	98.2	98.7	98.7	98.5	99.1	98.7

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
445	PWA-3	411	PR5-28
446	PWA-6B	435	PW5-35
447	PWA-7	437	PW9-27
448	PWA-32	438	PW9-43
440	PW10-5	441	PW11-10
442	PW11-17	436	XPW9-26
406	PR5-1	390	PR1-25

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-2. CONTINUED.

Ref. No.	Unit 2D						
	391	400	401	402	403	399	407
SiO ₂	55.80	52.40	56.60	55.30	57.20	54.40	52.80
Al ₂ O ₃	15.70	12.90	15.10	15.90	15.90	14.00	11.50
Fe ₂ O ₃	3.72	3.32	2.72	3.29	2.68	3.11	2.68
FeO	1.66	3.90	2.74	2.24	2.41	3.57	2.99
MgO	2.47	4.56	2.78	2.52	2.40	3.61	5.47
CaO	6.82	9.19	6.61	6.18	5.58	8.09	12.00
Na ₂ O	4.92	3.32	4.11	3.92	4.26	3.61	3.11
K ₂ O	5.31	5.29	5.75	6.64	6.29	5.68	4.32
TiO ₂	0.56	0.86	0.79	0.63	0.86	0.92	1.51
P ₂ O ₅	0.94	1.40	0.86	0.74	0.77	1.20	1.54
S	0.06	0.19	0.04	0.03	0.02	0.03	0.04
MnO	0.10	0.12	0.09	0.08	0.08	0.11	0.13
CO ₂	0.28	0.26	0.26	0.42	0.20	0.20	0.24
H ₂ O+	0.19	0.06	0.02	0.07	0.37	0.37	0.41
H ₂ O-	0.35	0.35	0.38	0.37	0.49	0.44	0.46
Total	98.9	98.1	98.9	98.3	99.5	99.3	99.2

Ref. No.	Unit 2D						
	409	412	421	423	430	432	410
SiO ₂	55.80	49.20	54.80	54.50	58.00	51.10	57.30
Al ₂ O ₃	16.50	13.20	15.40	16.30	16.20	13.40	18.00
Fe ₂ O ₃	3.77	1.99	2.66	3.81	2.28	2.81	1.20
FeO	1.66	3.15	2.74	1.83	2.49	3.49	2.49
MgO	2.00	5.87	2.81	2.24	1.87	4.60	2.33
CaO	5.50	12.50	6.41	5.96	4.71	11.00	2.06
Na ₂ O	4.51	3.87	3.61	4.60	4.64	3.89	3.91
K ₂ O	6.12	3.40	6.97	5.86	6.24	4.09	8.63
TiO ₂	0.72	0.57	0.89	0.93	0.83	0.61	0.74
P ₂ O ₅	0.77	1.50	0.89	0.83	0.70	1.30	0.79
S	0.02	0.02	0.03	0.02	0.02	0.02	0.02
MnO	0.10	0.11	0.08	0.11	0.08	0.12	0.05
CO ₂	0.26	2.58	0.42	0.22	0.22	1.56	0.28
H ₂ O+	0.20	0.58	0.09	0.07	0.28	0.01	0.51
H ₂ O-	0.42	0.59	0.41	0.40	0.39	0.39	0.37
Total	98.4	99.1	98.2	97.7	99.0	98.4	98.7

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
391	PR1-30B	409	PR5-23A
400	PR4-22	412	PR6-2
401	PR4-24	421	PR8-30
402	PR4-27	423	PR8-42
403	PR4-33	430	PR10-52
399	PR4-15	432	PR17-6
407	PR5-9	410	PR5-27A

TABLE A-2. CONTINUED.

R.P. SAGE

Ref. No.	Unit 2D		Unit 2E				
	443	439	444	392	408	417	418
SiO ₂	56.40	52.90	51.20	48.10	50.20	47.10	47.50
Al ₂ O ₃	15.10	13.10	14.60	9.39	10.90	9.66	9.21
Fe ₂ O ₃	3.07	3.50	5.29	4.77	4.19	4.62	4.75
FeO	2.16	2.82	2.41	3.90	2.82	3.57	4.07
MgO	2.51	3.98	4.19	6.38	5.54	6.39	6.97
CaO	5.87	9.93	9.04	15.50	14.30	15.50	15.40
Na ₂ O	4.55	3.45	3.00	2.31	2.56	2.96	2.60
K ₂ O	5.99	5.49	6.38	3.57	3.47	3.05	3.06
TiO ₂	0.93	1.03	1.00	1.06	1.20	1.17	1.17
P ₂ O ₅	0.82	1.40	0.87	2.18	1.74	2.30	2.22
S	0.01	0.02	0.02	0.16	0.08	0.09	0.24
MnO	0.08	0.10	0.14	0.15	0.14	0.15	0.15
CO ₂	0.20	0.22	0.38	0.32	0.30	0.78	0.36
H ₂ O+	0.42	0.42	0.04	0.11	0.42	0.35	0.77
H ₂ O-	0.39	0.41	0.47	0.42	0.47	0.53	0.46
Total	98.5	98.8	99.0	98.3	98.3	98.2	98.9

Ref. No.	Unit 2E		Unit 2F				
	420	426	433	434	395	393	394
SiO ₂	51.20	47.00	47.80	46.70	44.30	47.90	48.40
Al ₂ O ₃	14.70	9.97	11.20	13.40	10.00	11.20	11.90
Fe ₂ O ₃	3.62	4.29	3.72	4.88	4.86	3.23	3.36
FeO	1.91	3.57	3.49	2.16	2.74	3.57	2.91
MgO	3.75	6.17	6.65	5.94	7.93	7.12	6.05
CaO	10.10	14.60	14.50	11.80	14.50	13.90	13.70
Na ₂ O	3.12	2.63	3.78	3.24	1.24	3.22	3.39
K ₂ O	5.98	4.00	3.11	6.29	6.36	3.73	4.26
TiO ₂	1.11	1.09	0.77	0.61	1.16	0.82	0.58
P ₂ O ₅	1.20	2.20	1.90	1.58	2.90	1.78	1.88
S	0.02	0.04	0.07	0.07	0.03	0.04	0.02
MnO	0.11	0.14	0.14	0.13	0.13	0.14	0.12
CO ₂	1.22	0.84	0.26	0.24	0.74	0.26	0.28
H ₂ O+	0.36	0.59	1.74	0.94	0.11	0.27	0.39
H ₂ O-	0.43	0.93	0.71	0.57	0.44	0.79	0.72
Total	98.8	98.1	99.8	98.5	97.4	98.0	98.0

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
443	PR1-3B	420	PR8-18A
439	PW10-1	426	PR10-12
444	PW18-10	433	PW4-2
392	PR3-5	434	PW4-5
408	PR5-12A	395	PR3-11
417	PR8-1	393	PR3-8
418	PR8-3	394	PR3-10

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-2. CONTINUED.

Ref. No.	Unit 2F						
	396	397	404	405	425	427	429
SiO ₂	47.70	45.70	45.30	47.60	49.10	46.50	52.20
Al ₂ O ₃	12.20	9.95	10.90	12.10	14.50	13.60	14.30
Fe ₂ O ₃	2.29	3.84	4.84	3.71	3.18	2.88	3.03
FeO	4.73	3.49	2.24	3.24	2.32	2.49	2.57
MgO	6.21	7.55	7.20	6.08	4.73	5.81	3.74
CaO	13.80	16.00	14.50	13.30	11.10	13.10	9.11
Na ₂ O	3.29	2.76	1.34	4.45	4.35	6.88	3.53
K ₂ O	4.06	3.57	6.09	3.97	4.48	4.13	5.96
TiO ₂	0.67	1.03	0.95	0.72	0.52	0.48	0.73
P ₂ O ₅	1.54	2.70	2.94	1.80	1.10	1.88	1.30
S	0.03	0.02	0.04	0.10	0.01	0.04	0.04
MnO	0.15	0.13	0.11	0.13	0.11	0.11	0.10
CO ₂	0.34	0.30	0.48	0.36	0.32	0.42	0.28
H ₂ O+	1.55	1.40	0.61	0.49	2.24	1.98	0.98
H ₂ O-	0.78	0.66	0.55	0.60	0.87	0.91	0.57
Total	99.3	99.1	98.1	98.6	98.9	101.2	98.4

Ref. No.	Unit 2G	Unit 2K		Unit 2M		
	416	413	414	415	424	428
SiO ₂	44.10	54.90	54.40	49.80	54.80	54.70
Al ₂ O ₃	3.82	15.20	14.50	11.50	18.50	16.20
Fe ₂ O ₃	4.33	2.79	2.94	3.62	2.20	2.93
FeO	4.90	3.15	3.32	3.90	1.41	1.83
MgO	8.78	3.08	3.27	4.98	1.27	2.11
CaO	23.50	6.42	7.79	12.10	4.13	5.06
Na ₂ O	2.06	3.59	3.35	3.07	4.73	4.31
K ₂ O	0.17	6.79	6.38	4.49	7.41	7.99
TiO ₂	1.65	0.97	0.87	1.19	0.56	0.61
P ₂ O ₅	4.20	0.88	1.10	1.74	0.41	0.73
S	0.03	0.01	0.02	0.04	0.01	0.14
MnO	0.21	0.09	0.10	0.13	0.06	0.09
CO ₂	0.62	0.36	0.22	0.94	0.40	0.32
H ₂ O+	0.71	0.31	0.11	0.38	1.20	0.36
H ₂ O-	0.46	0.50	0.54	0.50	0.71	0.54
Total	99.5	99.0	98.9	98.4	97.8	97.9

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
396	PR3-16	416	PR6-37
397	PR3-17	413	PR6-9
404	PR4-37	414	PR6-13
405	PR4-39	415	PR6-14
425	PR8-45	424	PR8-44
427	PR10-14	428	PR10-17
429	PR10-19		

TABLE A-3. TRACE ELEMENT ANALYSES (PPM) OF WHOLE-ROCK SAMPLES FROM THE POOHBAH LAKE ALKALIC ROCK COMPLEX.

Ref. No.	Unit 2A					Unit 2B	
	445	446	447	448	440	442	406
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	3600	3900	3300	3600	1800	2300	1200
Be	6	6	5	5	6	9	7
Bi							
Co	15	20	14	15	14	12	16
Cr	43	68	46	47	49	41	75
Cu	26	24	19	26	17	16	26
Ga	15	15	15	15	15	15	15
Hg							
Li	10	10	7	82	9	40	16
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	17	27	20	22	28	20	30
Yb	1	1	<1	<1	<1	<1	<1
Pb	66	24	20	24	23	23	17
Rb	70	50	70	80	100	130	100
Sb							
Sc	9	15	7	7	15	15	10
Sn	9	<3	3	<3	<3	<3	<3
Sr	7000	7000	9000	6000	6000	5000	2500
Ti							
V	80	90	60	60	90	60	90
Y	40	45	30	30	45	30	45
Zn	120	130	110	92	94	93	100
Zr	500	250	200	70	250	200	350
La	200	250	150	<100	250	200	200
Nd	300	400	<100	200	250	200	200
Ce	570	730	400	460	410	420	440
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
445	PWA-3	440	PW10-5
446	PWA-6B	442	PW11-17
447	PWA-7	406	PR5-1
448	PWA-32		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE

TABLE A-3. CONTINUED.

Ref. No.	Unit 2C	Unit 2D					
	411	435	437	438	441	436	390
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	2100	2400	2400	2000	3200	3600	2300
Be	5	9	5	6	7	6	9
Bi							
Co	42	13	16	14	20	26	20
Cr	343	34	73	72	80	142	105
Cu	110	9	20	12	50	69	52
Ga	9	15	10	15	9	9	15
Hg							
Li	60	92	17	18	31	39	195
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	60	<30	<30	<30	<30	<30
Ni	220	15	33	31	33	68	44
Yb	1	<1	<1	<1	3	1	<1
Pb	10	21	20	24	16	15	30
Rb	110	270	80	100	80	80	90
Sb							
Sc	25	5	15	10	10	10	10
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	2000	6000	5000	5000	7000	6000	6000
Tl							
V	150	40	90	80	100	100	100
Y	35	20	40	40	40	45	45
Zn	124	124	94	92	102	138	128
Zr	250	300	200	1000	150	150	250
La	150	250	200	200	300	300	250
Nd	200	250	250	250	300	350	350
Ce	500	660	470	420	720	840	650
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
411	PR5-28	441	PW11-10
435	PW5-35	436	XPW9-26
437	PW9-27	390	PR1-25
438	PW9-43		

TABLE A-3. CONTINUED.

Ref. No.	Unit 2D						
	391	400	401	402	403	399	407
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	2300	3200	2000	2300	1500	2000	3800
Be	8	6	5	4	6	6	20
Bi							
Co	15	27	16	17	14	21	22
Cr	67	125	74	76	59	93	105
Cu	32	96	30	124	6	40	24
Ga	15	10	15	10	15	15	8
Hg							
Li	80	22	16	28	14	22	44
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	28	74	34	35	28	46	39
Yb	<1	2	1	<1	<1	1	2
Pb	33	14	23	14	20	17	24
Rb	200	90	80	110	120	90	140
Sb							
Sc	15	20	15	10	10	15	20
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	4000	4000	3500	4000	3000	3500	4000
Ti							
V	100	100	100	90	70	100	100
Y	45	50	40	25	30	45	70
Zn	103	145	100	91	100	144	110
Zr	150	250	200	100	200	600	250
La	200	250	250	150	150	300	400
Nd	200	350	250	200	200	300	600
Ce	470	670	510	340	400	630	1150
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
391	PR1-30B	403	PR4-33
400	PR4-22	399	PR4-15
401	PR4-24	407	PR5-9
402	PR4-27		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-3. CONTINUED.

Ref. No.	Unit 2D						
	409	412	421	423	430	432	410
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	1800	860	2000	1600	2600	4500	2500
Be	4	15	8	7	6	15	6
Bi							
Co	12	24	15	12	10	20	11
Cr	45	135	70	35	43	126	38
Cu	16	9	17	8	24	12	11
Ga	15	15	10	15	15	10	15
Hg							
Li	80	122	30	106	18	45	102
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	18	73	29	18	17	71	19
Yb	1	<1	<1	1	<1	1	<1
Pb	11	16	10	23	25	18	18
Rb	170	160	120	280	100	100	380
Sb							
Sc	9	15	10	6	7	15	5
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	2000	4000	4000	2500	4000	4000	5000
Ti							
V	100	50	90	80	70	90	20
Y	45	30	35	35	35	40	<10
Zn	100	114	92	148	104	110	124
Zr	250	250	200	300	300	250	250
La	150	250	200	300	200	200	150
Nd	200	250	250	250	250	250	200
Ce	370	440	330	590	480	480	440
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
409	PR5-23A	430	PR10-52
412	PR6-2	432	PR17-6
421	PR5-30	410	PR5-27A
423	PR8-42		

TABLE A-3. CONTINUED.

Ref. No.	Unit 2D		Unit 2E				
	443	439	444	392	408	417	418
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	1600	2700	3000	4900	4900	2900	2700
Be	4	7	8	7	10	6	10
Bi							
Co	15	20	24	31	25	28	35
Cr	66	88	134	127	113	123	136
Cu	25	27	12	48	63	50	134
Ga	15	10	8	9	8	9	10
Hg							
Li	28	44	170	44	33	48	70
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	31	48	71	69	58	59	76
Yb	<1	1	1	2	1	2	1
Pb	20	18	19	14	10	12	10
Rb	130	120	100	100	70	100	100
Sb							
Sc	15	15	7	20	20	15	15
Sn	<3	<3	4	<3	<3	<3	<3
Sr	3000	5000	6000	5000	3500	3000	3000
Ti							
V	70	90	100	150	100	150	100
Y	40	45	45	60	60	60	45
Zn	98	114	149	138	100	128	167
Zr	150	250	250	250	250	250	250
La	200	200	150	350	350	350	300
Nd	200	300	250	600	450	500	400
Ce	430	590	620	690	800	760	870
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
443	PR1-3B	408	PR5-12A
439	PW10-1	417	PR8-1
444	PW18-10	418	PR8-3
392	PR3-5		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-3. CONTINUED.

Ref. No.	Unit 2E		Unit 2F				
	420	426	433	434	395	393	394
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	3400	4100	1300	1400	2500	2200	220
Be	10	20	7	5	5	8	7
Bi							
Co	18	27	24	22	33	28	26
Cr	63	122	200	154	227	225	182
Cu	34	16	39	28	48	40	34
Ga	10	10	9	10	9	10	9
Hg							
Li	106	56	17	16	16	27	16
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	28	68	89	68	131	103	78
Yb	1	2	2	1	1	1	1
Pb	19	15	12	12	11	14	17
Rb	200	160	110	220	270	130	160
Sb							
Sc	9	20	20	15	25	20	15
Sn	<3	3	<3	<3	<3	<3	3
Sr	4000	4500	5000	3500	5000	6000	6000
Ti							
V	100	100	100	100	100	100	100
Y	45	70	50	45	45	45	45
Zn	94	159	108	100	108	120	95
Zr	200	250	250	200	200	300	250
La	250	400	250	200	300	300	250
Nd	350	500	350	250	500	400	350
Ce	710	860	540	430	840	520	420
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
420	PR8-18A	395	PR3-11
426	PR10-12	393	PR3-8
433	PW4-2	394	PR3-10
434	PW4-5		

TABLE A-3. CONTINUED.

Ref. No.	Unit 2F						
	396	397	404	405	425	427	429
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	220	1600	2200	1200	1100	600	2100
Be	8	7	4	7	7	6	7
Bi							
Co	27	28	29	26	17	21	17
Cr	216	210	222	190	81	130	85
Cu	48	36	50	34	46	34	34
Ga	15	15	9	9	15	9	15
Hg							
Li	31	12	25	11	56	8	40
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	102	118	125	80	56	67	44
Yb	2	1	<1	1	1	1	1
Pb	21	15	<10	12	18	10	15
Rb	120	190	240	100	160	140	170
Sb							
Sc	20	25	20	15	10	15	10
Sn	<3	<3	<3	<3	<3	7	<3
Sr	5000	3500	4500	4000	2500	5000	6000
Ti							
V	100	100	100	90	80	80	70
Y	50	50	50	45	30	45	45
Zn	115	106	91	108	98	68	102
Zr	300	500	150	200	300	200	250
La	300	300	350	250	250	300	250
Nd	400	400	400	300	250	300	250
Ce	480	670	710	520	440	400	500
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
396	PR3-16	425	PR8-45
397	PR3-17	427	PR10-14
404	PR4-37	429	PR10-19
405	PR4-39		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE

TABLE A-3. CONTINUED.

Ref. No.	Unit 2G	Unit 2K			Unit 2M	
	416	413	414	415	424	428
Ag	<1	<1	<1	<1	<1	<1
Au						
As						
Ba	80	2200	2300	2500	1700	1900
Be	8	15	8	7	5	5
Bi						
Co	30	18	17	23	7	13
Cr	146	83	74	95	24	40
Cu	22	29	20	52	7	34
Ga	7	15	15	10	15	15
Hg						
Li	65	38	14	32	38	10
Mn						
Mo	<1	<1	<1	<1	<1	<1
Nb	35	<30	<30	<30	<30	<30
Ni	56	38	37	53	11	16
Yb	2	<1	1	2	<1	<1
Pb	12	19	16	14	11	18
Rb	<10	150	140	160	152	80
Sb						
Sc	15	15	15	15	5	8
Sn	<3	<3	<3	<3	<3	<3
Sr	1000	4000	4500	2500	4500	6000
Ti						
V	100	100	100	100	60	70
Y	70	45	40	60	20	30
Zn	152	113	110	130	61	84
Zr	250	250	250	200	200	250
La	400	200	150	300	150	150
Nd	700	250	250	350	150	200
Ce	1390	440	410	710	880	390
Eu	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
416	PR6-37	415	PR6-14
413	PR6-9	424	PR8-44
414	PR6-13	428	PR10-17

TABLE A-4. NORMATIVE MINERALS (CIPW NORM) FOR WHOLE-ROCK SAMPLES FROM THE POOHBAH LAKE ALKALIC ROCK COMPLEX.

Ref. No.	Unit 2A					Unit 2B	
	445	446	447	448	440	442	406
S.G.	2.78	2.89	2.73	2.75	2.77	2.69	2.78
AP	2.369	3.537	1.682	2.207	2.055	1.250	2.074
PO	0.084	0.339	0.140	0.280	0.279	0.028	0.084
IL	1.532	2.035	1.571	1.612	1.566	1.397	1.601
OR	29.655	26.022	37.869	36.363	34.323	40.326	34.852
AB	39.092	28.598	34.532	36.690	30.659	33.707	31.972
AN	3.164	7.848	7.226	5.728	4.317	3.509	6.274
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	4.737	5.049	3.124	3.100	3.897	1.698	3.771
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	1.499	0.0	0.0	0.0	1.971	0.0	0.0
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	14.205	17.160	4.966	9.376	15.967	6.301	11.484
FO	0.0	1.042	2.164	1.149	0.0	1.063	1.322
FA	0.0	0.395	1.138	0.330	0.0	1.121	0.390
NE	1.427	2.830	3.523	1.034	4.014	4.344	3.493
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	2.236	5.147	2.066	2.130	0.952	5.256	2.683
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

S.G. - Specific Gravity; AP - Apatite; PO - Pyrrhotite; IL - Ilmenite; OR - Orthoclase;
 AB - Albite; AN - Anorthite; C - Corundum; AC - Actinolite; MT - Magnetite;
 HM - Hematite; WO - Wollastonite; EN - Enstatite; FS - Ferrosilite; Q - Quartz;
 DI - Diopside; FO - Forsterite; FA - Fayalite; NE - Nepheline; LC - Leucite;
 KP - Kalsilite; HE - Hedenbergite; CC - Calcite; RU - Rutile; NS - Na₂SiO₃;
 KS - Kalsilite; CR - Chromite; LN - Larnite.

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
445	PWA-3	440	PW10-5
446	PWA-6B	442	PW11-17
447	PWA-7	406	PR5-1
448	PWA-32		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-4. CONTINUED.

	Unit 2C			Unit 2D			
Ref. No.	411	435	437	438	441	436	390
S.G.	3.00	2.70	2.75	2.77	2.79	2.89	2.78
AP	2.388	1.598	2.002	2.083	2.384	3.079	2.296
PO	0.285	0.056	0.085	0.084	0.113	0.168	0.056
IL	2.251	1.679	1.502	1.550	1.445	1.745	1.860
OR	10.933	41.768	38.467	37.057	37.816	30.378	33.619
AB	0.0	32.231	29.777	31.239	25.333	18.642	30.457
AN	6.128	8.060	7.037	4.437	5.528	5.782	5.910
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	5.306	2.787	4.081	3.772	5.884	5.596	5.568
HM	0.0	0.0	0.0	0.0	0.022	0.0	0.139
WO	0.0	0.0	0.0	0.0	0.673	0.0	0.0
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	38.091	4.438	10.432	13.463	17.944	22.287	16.286
FO	6.676	2.594	1.362	0.505	0.0	1.633	0.853
FA	1.446	0.226	0.421	0.095	0.0	0.394	0.0
NE	12.675	4.258	2.281	3.701	2.859	6.046	2.956
LC	7.292	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	6.528	0.306	2.553	2.013	0.0	4.251	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
411	PR5-28	441	PW11-10
435	PW5-35	436	XPW9-26
437	PW9-27	390	PR1-25
438	PW9-43		

TABLE A-4. CONTINUED.

Ref. No.	Unit 2D						
	391	400	401	402	403	399	407
S.G.	2.78	2.87	2.77	2.76	2.74	2.83	2.92
AP	2.224	3.336	2.032	1.761	1.814	2.831	3.643
PO	0.168	0.535	0.112	0.084	0.056	0.084	0.112
IL	1.085	1.678	1.528	1.228	1.659	1.777	2.924
OR	32.040	32.140	34.645	40.301	37.795	34.172	26.055
AB	33.754	21.151	32.830	25.580	33.050	25.187	22.227
AN	5.161	4.786	5.864	6.322	5.760	5.295	4.741
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	3.693	4.944	4.017	4.895	3.947	4.586	3.962
HM	1.248	0.0	0.0	0.0	0.0	0.0	0.0
WO	2.376	0.0	0.0	0.627	0.0	0.0	2.233
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	13.534	21.832	14.596	13.890	12.100	17.633	29.960
FO	0.0	1.081	0.200	0.0	0.324	0.679	0.0
FA	0.0	0.256	0.047	0.0	0.051	0.212	0.0
NE	4.718	4.172	1.404	4.579	1.931	3.185	2.493
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	4.090	2.725	0.734	1.514	4.358	1.650
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
391	PR1-30B	403	PR4-33
400	PR4-22	399	PR4-15
401	PR4-24	407	PR5-9
402	PR4-27		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-4. CONTINUED.

Ref. No.	Unit 2D						
	409	412	421	423	430	432	410
S.G.	2.75	2.88	2.77	2.76	2.72	2.87	2.67
AP	1.833	3.648	2.122	1.985	1.656	3.128	1.879
PO	0.056	0.058	0.085	0.057	0.056	0.057	0.056
IL	1.403	1.135	1.738	1.821	1.608	1.202	1.441
OR	37.143	21.087	42.382	35.741	37.643	25.090	52.350
AB	32.192	13.046	21.776	29.640	37.319	18.336	27.296
AN	6.862	9.015	5.358	6.709	5.029	7.274	5.177
C	0.0	0.0	0.0	0.0	0.0	0.0	0.377
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	3.535	3.025	3.965	3.523	3.372	4.225	1.784
HM	1.430	0.0	0.0	1.499	0.0	0.0	0.0
WO	0.753	0.0	0.0	0.935	0.0	0.223	0.0
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	11.023	30.339	14.434	12.407	8.969	25.626	0.0
FO	0.0	0.884	0.352	0.0	0.414	0.0	4.170
FA	0.0	0.221	0.077	0.0	0.136	0.0	1.877
NE	3.770	11.531	5.210	5.683	1.473	8.558	3.592
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	6.010	2.499	0.0	2.325	6.282	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
409	PR5-23A	430	PR10-52
412	PR6-2	432	PR17-6
421	PR8-30	410	PR5-27A
423	PR8-42		

TABLE A-4. CONTINUED.

Ref. No.	Unit 2D			Unit 2E			
	443	439	444	392	408	417	418
S.G.	2.75	2.86	2.88	3.07	2.98	3.00	3.09
AP	1.951	3.324	2.057	5.192	4.157	5.528	5.297
PO	0.028	0.056	0.056	0.450	0.226	0.256	0.677
IL	1.812	2.002	1.935	2.067	2.347	2.302	2.286
OR	36.345	33.234	38.456	21.682	21.138	18.692	18.617
AB	33.783	20.992	10.264	12.092	20.442	12.647	12.608
AN	3.152	4.125	7.654	4.826	8.232	4.203	4.451
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	4.566	5.194	5.280	7.101	5.653	6.940	7.084
HM	0.0	0.0	1.749	0.0	0.416	0.0	0.0
WO	1.438	3.056	1.161	4.974	5.733	5.270	3.196
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	13.830	21.879	22.935	35.188	30.646	35.563	38.509
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	3.091	4.811	8.451	4.321	1.010	7.205	5.427
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.004	1.327	0.0	2.107	0.0	1.394	1.758
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
443	PR1-3B	408	PR5-12A
439	PW10-1	417	PR8-1
444	PW18-10	418	PR8-3
392	PR3-5		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-4. CONTINUED.

Ref. No.	Unit 2E		Unit 2F				
	420	426	433	434	395	393	394
S.G.	2.84	3.03	2.96	2.91	2.97	2.93	2.88
AP	2.877	5.334	4.539	3.788	6.998	4.273	4.516
PO	0.057	0.115	0.198	0.198	0.086	0.114	0.057
IL	2.179	2.164	1.506	1.197	2.292	1.612	1.141
OR	36.250	24.728	18.946	20.819	10.943	22.832	26.095
AB	13.224	7.934	8.802	0.0	0.0	5.300	6.019
AN	8.863	3.736	4.533	3.540	3.035	5.259	4.828
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	3.259	6.501	5.555	5.283	5.904	4.846	5.045
HM	1.494	0.0	0.0	1.399	0.983	0.0	0.0
WO	3.366	3.982	2.114	1.633	0.0	0.0	2.404
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	20.817	34.638	36.789	32.973	40.514	37.806	33.655
FO	0.0	0.0	0.0	0.0	1.233	0.576	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.094	0.0
NE	7.615	8.300	13.074	15.346	5.912	12.401	12.830
LC	0.0	0.0	0.0	13.823	22.101	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	2.570	3.944	0.0	0.0	4.887	3.410
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
420	PR8-18A	395	PR3-11
426	PR10-12	393	PR3-8
433	PW4-2	394	PR3-10
434	PW4-5		

TABLE A-4. CONTINUED.

Ref. No.	Unit 2F						
	396	397	404	405	425	427	429
S.G.	2.89	2.98	2.94	2.97	2.80	2.81	2.81
AP	3.696	6.475	7.072	4.298	2.672	4.456	3.122
PO	0.085	0.057	0.114	0.282	0.029	0.112	0.114
IL	1.316	2.022	1.871	1.408	1.034	0.931	1.435
OR	24.845	21.830	19.659	24.171	27.749	0.0	36.497
AB	0.428	0.928	0.0	4.531	9.640	0.0	16.613
AN	6.746	4.350	5.935	1.346	7.118	0.0	5.752
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	8.513	0.0
MT	3.435	5.756	4.704	5.537	4.828	0.0	4.548
HM	0.0	0.0	1.775	0.0	0.0	0.0	0.0
WO	0.0	0.787	0.0	3.318	2.822	1.936	1.360
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DI	32.440	41.925	37.914	33.616	26.606	28.437	20.799
FO	0.673	0.0	0.712	0.0	0.0	1.120	0.0
FA	0.280	0.0	0.0	0.0	0.0	0.326	0.0
NE	15.368	12.574	6.369	18.539	15.655	25.978	7.751
LC	0.0	0.0	13.785	0.0	0.0	19.569	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	10.687	3.295	0.0	2.954	1.847	6.546	2.009
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.431	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	1.646	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
396	PR3-16	425	PR8-45
397	PR3-17	427	PR10-14
404	PR4-37	429	PR10-19
405	PR4-39		

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-4. CONTINUED.

Ref. No.	Unit 2G	Unit 2K			Unit 2M	
	416	413	414	415	424	428
S.G.	3.03	2.80	2.82	2.93	2.65	2.73
AP	9.968	2.086	2.603	4.181	0.996	1.752
PO	0.084	0.028	0.056	0.114	0.029	0.397
IL	3.206	1.882	1.686	2.341	1.114	1.199
OR	1.029	41.038	38.495	27.510	45.903	48.909
AB	12.575	22.630	21.575	15.243	22.657	17.906
AN	0.691	5.404	5.782	4.481	7.691	1.281
C	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0
MT	6.423	4.133	4.348	5.437	3.189	3.531
HM	0.0	0.0	0.0	0.0	0.105	0.597
WO	9.221	0.0	0.0	2.221	0.743	1.956
EN	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0
DI	48.253	13.802	16.804	27.708	7.144	11.729
FO	0.0	1.008	0.362	0.0	0.0	0.0
FA	0.0	0.290	0.114	0.0	0.0	0.0
NE	2.848	4.554	3.975	6.317	10.430	10.743
LC	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0
HE	5.702	3.144	4.201	4.448	0.0	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
416	PR6-37	415	PR6-14
413	PR6-9	424	PR8-44
414	PR6-13	428	PR10-17

TABLE A-5. AVERAGE CHEMICAL COMPOSITIONS* (WEIGHT PERCENT AND PPM) OF LITHOLOGIC UNITS FOR THE POOHBAH LAKE ALKALIC ROCK COMPLEX.

	Unit 2a (N = 6)		Unit 2d (N = 22)	
	Mean	Std. Deviation	Mean	Std. Deviation
SiO ₂	55.80	1.86	54.83	2.21
Al ₂ O ₃	15.20	1.20	15.12	1.59
Fe ₂ O ₃	2.69	0.54	2.99	0.75
FeO	2.90	0.75	2.60	0.70
MgO	2.77	0.55	3.18	1.17
CaO	6.58	1.72	6.99	2.54
Na ₂ O	4.47	0.33	4.08	0.51
K ₂ O	5.49	0.75	5.82	1.08
TiO ₂	0.86	0.10	0.82	0.20
P ₂ O ₅	0.98	0.26	0.98	0.26
MnO	0.10	0.02	0.10	0.02
CO ₂	0.26	0.04	0.43	0.56
S	0.08	0.04	0.04	0.04
H ₂ O+	0.42	0.21	0.26	0.19
H ₂ O-	0.44	0.03	0.51	0.46
LOI	0.00	0.00	0.00	0.00
TOTAL	99.00	0.57	98.65	0.45
Ag	<1.00	0.00	<1.00	0.00
Ba	3016.67	923.94	2398.18	834.99
Co	15.17	2.48	17.00	4.83
Cr	50.50	8.92	78.64	32.46
Cu	21.33	4.55	32.64	30.13
Li	21.17	29.82	55.82	46.18
Ni	23.33	4.37	37.00	18.57
Pb	29.83	17.78	20.23	6.32
Zn	106.33	16.27	112.05	18.44
Be	5.50	0.55	7.68	4.02
Mo	<1.00	0.00	<1.00	0.00
Sc	11.33	4.08	10.77	6.32
Sr	6833.33	1169.05	4250.00	1222.31
V	76.67	13.66	83.64	22.37
Y	38.33	6.83	37.73	14.53
Ga	15.00	0.00	13.00	2.74
Nb	<30.00	0.00	<25.91	19.19
Rb	78.33	19.41	144.09	78.90
Zr	261.67	140.77	268.18	191.20
Sn	0.00	5.02	<3.00	0.00
Eu	<100.00	0.00	<100.00	0.00
Yb	<0.33	1.03	0.00	1.31
Ce	500.00	128.37	541.36	190.22
La	158.33	131.97	229.55	62.98
Nd	225.00	172.48	268.18	89.37

*The average compositions may include duplicate samples or analyses which are not listed in Tables A-2 to A-4.

CARBONATITE - ALKALIC ROCK COMPLEXES: POOHBAH LAKE
TABLE A-5 . CONTINUED.

	Unit 2e (N = 8)		Unit 2f (N = 13)	
	Mean	Std. Deviation	Mean	Std. Deviation
SiO ₂	49.42	2.28	47.48	1.96
Al ₂ O ₃	11.44	2.33	12.05	1.50
Fe ₂ O ₃	4.38	0.61	3.62	0.81
FeO	3.13	0.76	3.04	0.73
MgO	5.42	1.27	6.31	1.15
CaO	13.05	2.83	13.32	1.77
Na ₂ O	2.83	0.37	3.43	1.41
K ₂ O	4.37	1.36	4.60	1.15
TiO ₂	1.10	0.07	0.76	0.20
P ₂ O ₅	1.76	0.55	1.93	0.58
MnO	0.14	0.02	0.13	0.02
CO ₂	0.55	0.35	0.35	0.14
S	0.08	0.08	0.04	0.02
H ₂ O+	0.38	0.24	0.99	0.73
H ₂ O-	0.51	0.17	0.69	0.14
LOI	0.00	0.00	0.00	0.00
TOTAL	98.55	0.36	98.72	0.99
Ag	<1.00	0.00	<1.00	0.00
Ba	3575.00	936.18	1441.54	766.61
Co	26.00	5.55	25.15	4.78
Cr	113.25	25.27	180.46	52.15
Cu	48.00	38.88	39.31	6.85
Li	71.37	45.80	23.00	13.34
Ni	59.62	15.56	89.54	26.92
Pb	14.62	3.78	12.31	7.38
Zn	131.12	26.94	102.54	13.24
Be	9.75	4.43	6.54	1.20
Mo	<1.00	0.00	<1.00	0.00
Sc	15.12	5.00	17.69	4.84
Sr	4250.00	1069.04	4769.23	1129.44
V	111.25	24.16	93.08	10.32
Y	53.75	9.91	45.38	5.19
Ga	9.25	0.89	11.08	2.75
Nb	<30.00	0.00	<30.00	0.00
Rb	118.75	41.55	165.38	51.74
Zr	243.75	17.68	261.54	86.97
Sn	<1.37	3.02	<1.77	3.11
Eu	<100.00	0.00	<100.00	0.00
Yb	1.37	0.52	1.08	0.76
Ce	737.50	103.89	540.77	128.55
La	293.75	86.34	273.08	38.81
Nd	418.75	116.30	350.00	76.38

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